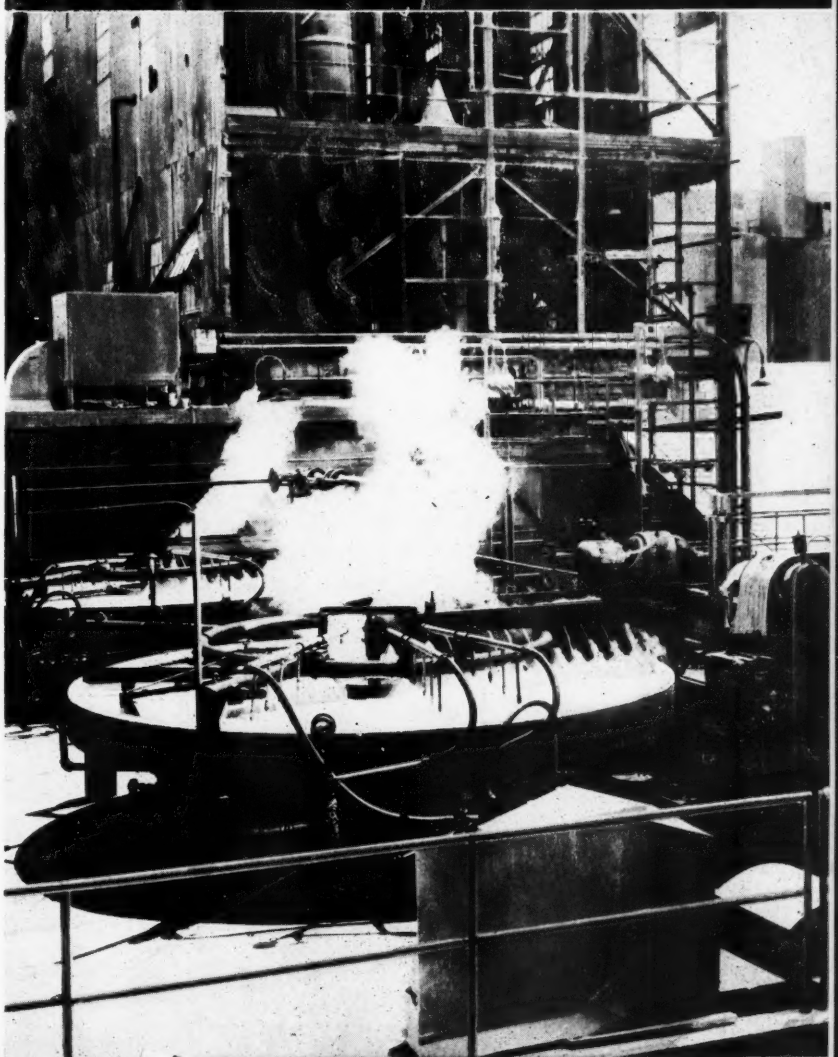
EBRU RY

Farm Chemicals



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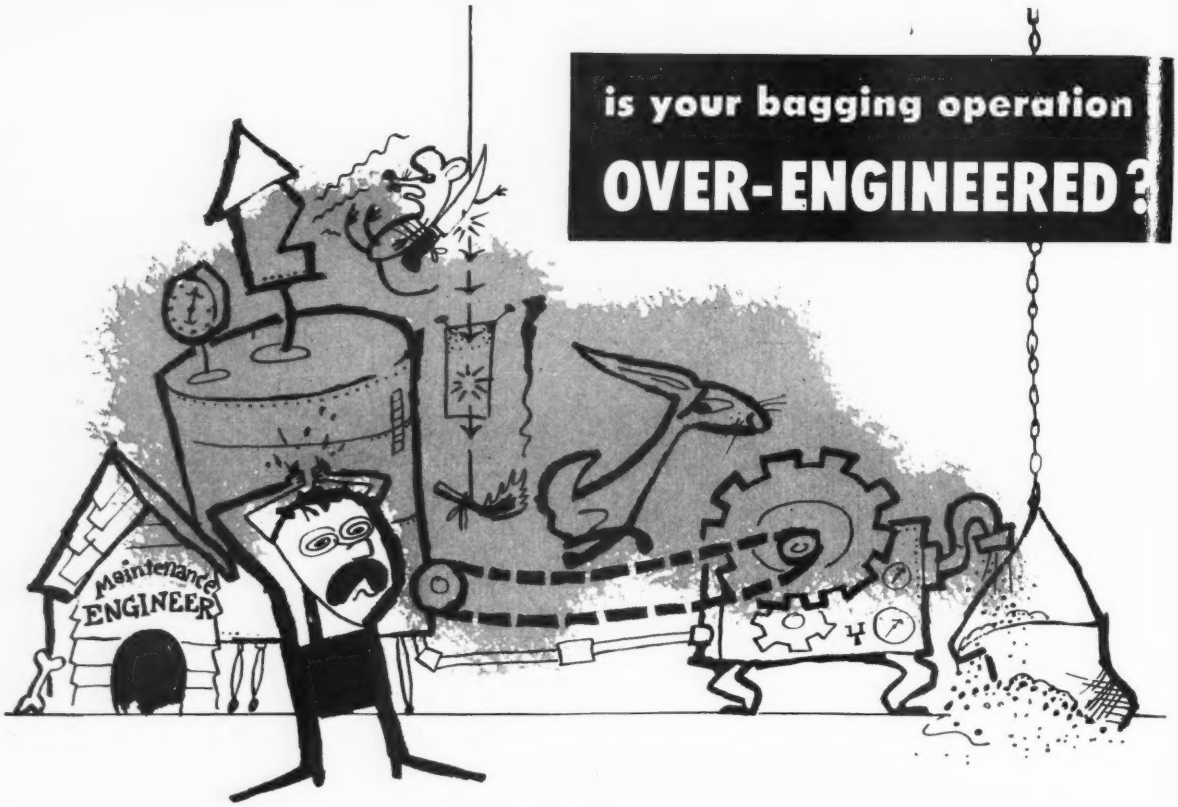
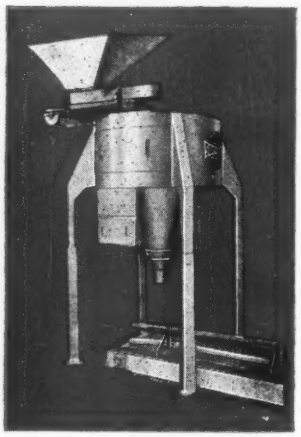
VOL. 1



You need the new SOUTHLAND PACKER!

- **IT'S SIMPLE!** Just one scale system—*not two or three*—fewer moving parts, wearing points.
- **IT'S FAST!** Up to 30 50-lb. bags per minute, up to 25 80's and 100's—more than a single sewing machine can handle.
- **IT'S GUARANTEED ACCURATE!** Maintained weighing accuracy is guaranteed on 50-lb., 80-lb., 100-lb., and 200-lb. bags.
- **IT'S DURABLE, RUGGED!** Heavier, more rigid construction—generous use of stainless steel and non-corroding nylon bushings.
- **IT'S COMPLETELY ELECTRIC!** No troublesome air cylinders or hydraulic connections—needs no compressor.



The SOUTHLAND costs less, *saves more* . . . less spillage and dusting; minimum headroom and floor space; simple installation and maintenance. Enthusiastic users say it's "tops" in dependability.

All this, complete, less conveyor

only $2500

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Whether your shipments come by rail, truck or vessel...

YOU ARE ALWAYS SURE OF

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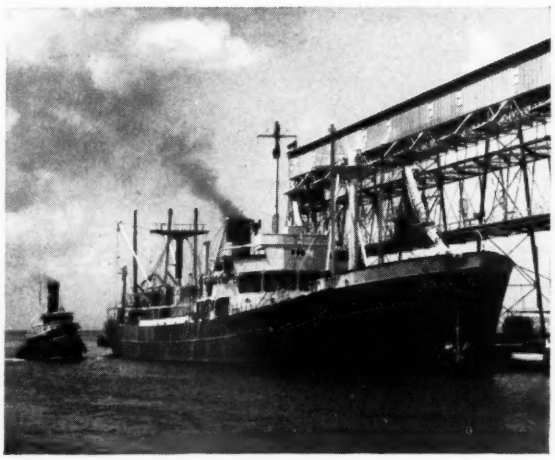

PHOSPHATE ROCK

You expect grade uniformity . . . and you get it . . . when you order *International Phosphate Rock*, whether it comes to you by rail, by truck or by vessel. And you always get it on time, in the tonnages and grades you want. International phosphate rock is sampled and laboratory tested at every stage of production from mine pit to loaded car . . . recovery, blending, drying, grinding, loading. That's the secret of the unusual grade uniformity and quality of *International Quality-Controlled* Phosphate Rock.

For acidulation . . . for industrial chemicals . . . for direct application to the soil.
(Ground Rock)

INTERNATIONAL MINERALS *International* MINERALS CHEMICALS **& CHEMICAL CORPORATION**

PHOSPHATE MINERALS DIVISION..... .....20 N. WACKER DRIVE, CHICAGO 6

PHOSPHATE MINES AND PLANTS IN FLORIDA AT NORALYN, PEACE VALLEY, ACHAN, MULBERRY; IN TENNESSEE AT MT. PLEASANT, WALES AND GODWIN

IN THIS ISSUE

▶ In modern fertilizer making, the most efficient practices and equipment are also the safest, says Elmer C. Perrine, who points out that carelessness can be costly in the article beginning on . . . **page 34.**

▶ Twelve-month Canadian sales of plant foods (to June 30) and pesticides (to September 30) are reported and tabulated on . . . **page 36.**

▶ While awaiting the outcome of the current court action seeking a permanent injunction to prevent the federal government from engaging in unwanted pesticide sprayings, let's take another look at the pest that really started the dispute, the **Gypsy Moth . . . page 38.**

▶ **Farm Chemicals** went to the twelfth annual meeting of the Northeastern Weed Control Conference. Some highlights begin on . . . **page 40.**

▶ For an explanation and discussion of Public Law 518, including its impact on herbicide research and recommendations, turn to . . . **page 42**

COVER PICTURE

A view of the Trona, California, plant of American Potash and Chemical Corporation, showing two 15 feet diameter Oliver Hortizontal Filters dewatering and washing agricultural grade potash. These units, with a wash efficiency of about 90 per cent, are two of over forty different filter installations at the plant, where A P and C C produces muriate of potash, granular muriate of potash, sulfate of potash, and borax.

Farm Chemicals

Vol. 121 No. 2 February 1958

PIONEER JOURNAL OF THE INDUSTRY

FEATURES

INDUSTRY NEWS

DEPARTMENTS

STAFF

ADVERTISING REPRESENTATIVES

BPA

MEMBER BUSINESS PUBLICATIONS AUDIT

A magazine national in scope and circulation and devoted to manufacturers, mixers and formulators of plant foods and pesticides. It has a free controlled circulation within specified segments of the industry.

Subscription rates to all others are: U.S., its possessions, Canada, Cuba and Panama—$6.00; Mexico and foreign: $7.50. Single Copy—$.50. Back Numbers $1.00.

Published monthly by

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grow quality with POTASH!

You name the row crop—and you'll find that it grows better, produces more, brings higher prices, when it is supplied with plenty of *available* Potash.

Nature can go only so far in providing vitally needed Potash. Fast-growing, high-producing crops can easily exhaust the available soil supply—and then it's up to you. That's why it's good business to be sure your fertilizer program includes plenty of POTASH—either in your mixed fertilizers or as a supplemental application.

American Potash & Chemical Corporation is a basic supplier of Potash. Consult your fertilizer dealer today and be sure to specify plenty of TRONA® POTASH, *the vitally needed plant food.*

American Potash & Chemical Corporation

TRONA

Producers of: BORAX • POTASH • SODA ASH • SALT CAKE • LITHIUM • BROMINE • CHLORATES • PERCHLORATES • MANGANESE DIOXIDE • *and a diversified line of specialized agricultural and refrigerant chemicals.*

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214 WALTON BUILDING, ATLANTA 3, GEORGIA

SPROUT-WALDRON INSTITUTES SALES DIVISION CHANGES

Sprout-Waldron has announced that its sales organization will change from product line to geographical divisions of responsibility. Harold Alsted, vice president in charge of sales, stated that the growth of the sales organization coupled with the accelerating company trend toward complete systems engineering has necessitated the change.

Under the new policy, eight area managers will have the responsibility of coordinating all activity emanating from or concerning specific geographical territories. These men, located at Muncy, Pa., will serve as the nerve center for the fifty-one salaried sales representatives in the field. Named as managers are: S. E. Brong, Northeastern District; C. R. Lockard, Middle Atlantic District; R. F. Confer, Central District; J. L. Muffly, Metropolitan District; R. M. Miller, Southern District; J. W. Ellmaker, North Central District; K. R. Rohm, South and Central Western District, and D. A. Daugherty, Western District.

AP&C OPENS NEW OFFICE

American Potash and Chemical Corp. has opened an office in Chicago to service the area bounded roughly by North Dakota to Kansas on the west, Oklahoma to Arkansas on the south, and Kentucky to Michigan on the east.

John L. Anderson has been appointed manager of the Chicago office and Edward C. O'Connor and Wallace O'Dowd have been named sales representatives. Anderson joined American Potash recently after serving as vice president in charge of sales for the George C. Peterson Co., petroleum products distributors. O'Connor has been with AP&C since 1955 as sales representative operating from Oskaloosa, Iowa, and O'Dowd was previously with the Spencer Chemical Co.

U.S.I. ADDS FACILITIES TO KANSAS PLANT

New sulfuric acid decomposition and purification facilities have been put in operation at the Sunflower, Kansas plant of U. S. Industrial Chemicals Co., a division of National Distillers and Chemical Corp.

The addition of the decomposition and purification unit to the Sunflower sulfuric acid plant will provide U. S. I.'s midwest customers with the means of profitably disposing of spent acid. Its designed capacity is 70 tons of alkylation spent acid per day. The regenerated sulfuric acid product is identical to that produced from sulfur. The new facilities, designed by Chemical Construction Corp., bring the total capacity of the Sunflower plant to 250 tons per day on a 100 per cent sulfuric acid basis.

ABBOTT EXPANDS RESEARCH PROGRAM

Abbott Laboratories broke ground in December for five new buildings at its 220-acre Research Farm near Mundelein, Ill. Completion is expected by early spring.

Containing a total of 27,000 square feet, the buildings will include a cattle barn for 100 feeder cattle, two poultry buildings for a total of 6,500 birds, two swine buildings for 240 animals, and connecting buildings for service and feed storage. They will provide additional facilities for field tests to prove the usefulness of new products for farm animals under actual farm conditions and to obtain new information on products already available to the farmer.

In addition to studies in animal health and nutrition, crop growth will be studied. The studies will include experiments with gibberellic acids and other stimulants.

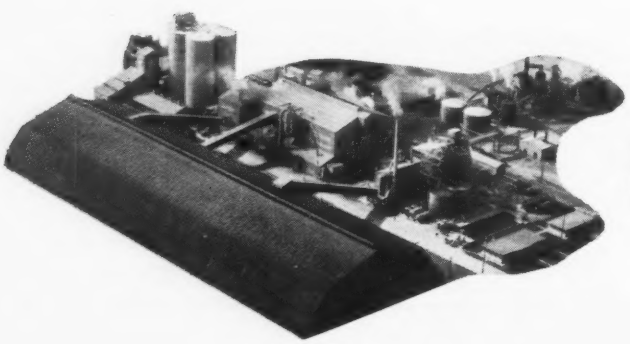
U.S.I. SALES EXECUTIVES TAKE TOUR

Shown are sales executives of U. S. Industrial Chemicals Co., division of National Distillers and Chemical Corp., on their recent tour of Midwestern feed lots where Morea® a new livestock liquid feed supplement is being fed to cattle. U.S.I. has exclusive license to manufacture and distribute the new product (developed by Feed Service Corp.) in most states east of the Mississippi and west of the Continental Divide. W. H. McInnis, Feed Product Sales; W. W. Rule, Louisville; F. M. Henley, Detroit; J. Nosky, Feed Service Corp.; Crete, Neb.; R. E. Alexander, L. A.; A. C. Brooks, Baltimore.

HOW TOUGH IS YOUR

RUN-OF-PILE — International's fine-textured Triple provides uniform particle size, even density and proper moisture level that lets you ammoniate at higher rates and temperatures.

Solve it with



INTERNATIONAL'S MAMMOTH NATURAL CURING UNIT is as big as two full-sized football fields. Natural curing over a period of weeks, the longest in the industry, insures superior physical and handling characteristics.

International's TRIPLE SUPER in the form you want!

EVERY TON IS NATURAL CURED

Whether your plant operation demands a fine, coarse or granular texture, you'll find International's Triple Super offers the superior physical and handling characteristics you need. But International offers much more than just the correct texture. Every ton brings you a guaranteed minimum of 46% APA — the consistent high analysis that aids in formulation and reduces the unit-delivered cost. It's the one triple that insures higher quality through extra long chemical reaction time and unmatched heat control, plus natural curing. Write or wire for full information on International's fine, coarse or new granular Triple Super.

EXTRAS put bonus value in every ton of International Triple Super

- **EXTRA grade to start with.**
- **EXTRAS in processing and natural curing.**
- **EXTRAS in quality safeguards.**

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

PHOSPHATE CHEMICALS DIVISION .... 20 N. WACKER DRIVE, CHICAGO 6, ILL.

FARM CHEMICALS People

Aceto Chemical Co. has announced the appointment of Irving Rosen as vice president in charge of sales. A member of the firm for almost five years, Rosen has been responsible for the market research and sales development of a number of new Aceto products.

American Potash & Chemical Co. Richard J. Hefler has been elected vice president, finance. Hefler, who joined American in 1948, was named secretary of the company in 1953 and, additionally, assistant to the president in 1954.

Formerly with the Hanover Bank in New York City and E. I. du Pont de Nemours & Co. at Wilmington, Del., his education includes a B. A. degree in business administration from Dartmouth College, graduate studies at Fordham Law School and New York University and a masters degree in business administration from the University of Southern California.

Arkansas Plant Food Co. The firm lost its general manager on December 23 with the death of McCarthy Dean Broadfield, 68.

Associated with the industry since 1912, Mr. Broadfield was the inventor of the "Broadfield Unit," a mechanical device used in the manufacture of phosphate fertilizer. He was an officer in the Phosphate Acidulating Corp., which handled sales of the unit. The company established offices in New York and London in 1933.

A native of Georgia, Mr. Broadfield came to Arkansas in 1941 when Arkansas Fertilizer Co. installed a Broadfield unit and remained as production manager until 1949 when he left to promote a farmer-owned fertilizer plant which developed into Arkansas Farmers Fertilizer Co. and later became Arkansas Plant Food Co.

Bradley & Baker. Arthur G. Riddell, Jr., has joined the firm as a fertilizer sales representative in the Middle West. He will cover Illinois, Indiana, Ohio and Wisconsin. Riddell was formerly associated with the Bag division of Virginia-Carolina Chemical Corp.


Riddell

California Spray-Chemical Co. Robert H. Houston has been appointed Supervisor Trainee and is currently receiving on-the-spot training in the manufacture of the Ortho Line of agricultural chemicals. Houston went to Cal-Spray as a salesman following his graduation from Stanford University. In 1954 he received a leave of absence to attend the University of California where he recently completed work on his M. S. degree. Following this period of graduate work, he was appointed to his present position.

Frederick A. Tacke has been named plant maintenance engineer at the Richmond fertilizer and pesticide plant. Tacke was graduated from Arizona State College with a B. S. in chemistry and from the University of California with a B. S. degree in chemical engineering.

Collier Carbon and Chemical Corp. has elected the following officers: W. L. Stewart, Jr., chairman of the board; Robert T. Collier, president; Homer Reed, William C. Kaesche, Robert S. Ray, vice presidents; Howard W. Wright, secretary; Paul Foreman, assistant secretary; Frank H. Dlouhy, treasurer; W. C. Van Siclen, assistant treasurer. R. G. Greip will serve as company comptroller.

Commercial Solvents Corp. has named William S. Leonhardt treasurer to succeed Howard L. Sanders who has become president of Northwest Nitro-Chemicals, Ltd., a Canadian affiliate of Commercial Solvents. Leonhardt's former position was budget director.

Harold W. Lloyd, A. T. Montgomery, and Frank M. Bennett have been named sales representatives in the firm's Agricultural Chemicals Dept.

Du Pont Co. has assigned W. Delmar Murphy, Jr., as sales representative for Du Pont nitrogen products in Michigan, Wisconsin, and the Chicago area. Murphy, who joined the Du Pont Polychemicals Dept. in 1956 as a market analyst, was graduated from the University of Illinois with a degree in general agriculture and from Michigan State University where he received a master's degree in agricultural economics.


Murphy

Eastman Chemical Products, Inc., has advanced and elected several officers including two new vice presidents. Spencer E. Palmer, a vice president, moves up to first vice president of the firm, Eastman Kodak Co.'s marketing subsidiary for products manufactured by the Tennessee and Texas Eastman divisions. R. S. Leonard, former comptroller, will assume the duties of assistant vice president and R. L. Flanary, assistant comptroller, will become comptroller.

The new officers are Dr. James E. Magoffin and David C. Williams who were elected vice presidents. Dr. Magoffin will be in charge of the chemicals division

QUIZ
For Multiwall Bag Buyers

"How Does Your Packaging Operation Rate?"

Perhaps we may be able to help you to arrive at the right answers in order to achieve higher production at lower costs.

KRAFT BAG CORPORATION

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Sales Agents for The **Kraftpacker** Open Mouth Bag Filling Machine

Gilman PAPER CO.
- St. Marys Kraft Corp.
- Gummed Tape Div.
- The Celluseal Corp.
- Kraft Bag Corp.

☐ O.K. Kraft... Help me to answer your Quiz. Please have representative call.

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

PRODUCT MFD._____ NAME_____

FARM CHEMICALS People

of Eastman Chemical Products, Inc., succeeding Henry L. Ford, who has been elected a vice president of Tennessee Eastman Co. Williams will head the plastics division now under the direction of Palmer. W. Chamberlain Hale has been elected an assistant vice president of Tennessee Eastman Co.

Ferro Corp. C. Dudley Clawson, company president, died January 4 of a heart attack while on a trip to Mexico City, Mexico. Associated with the firm for 27 years, Mr. Clawson had been president since 1947.

Grace Chemical Co., division of W. R. Grace & Co. has appointed Dr. J. D. Aughtry, manager of agricultural services to its main office in Memphis, Tenn. Dr. Aughtry will assist the company sales force in technical problems concerning nitrogen applications and Soil Development.


Aughtry

International Minerals & Chemical Corp. Basil M. Surgent has been named an agricultural sales representative in the company's potash division. He will cover New York, New Jersey, Pennsylvania, Maryland, and Delaware. Surgent succeeds Robert A. Heuerman who will be the company's potash sales representative in Quebec province, the New England states, Virginia, Baltimore, and New York City.

National Distillers and Chemical Corp. William G. Maguire, president and chairman of the board of directors of Panhandle Eastern Pipe Line Co., and Charles E. Main, president of the Clark Estates, Inc., have been elected to the board of directors of National Distillers and Chemical Corp.

The election was coincident with National Distillers' acquisition of Panhandle Eastern Pipe Line Co.'s 40 per cent minority interest in National Petro-Chemicals Corp., making National Petro a wholly-owned subsidiary of National Distillers. Panhandle Eastern received 1,500,000 shares of National Distillers' common stock for its interest in National Petro.

Olin Mathieson Chemical Corp. Elmo Jenson has been promoted to area sales supervisor, south Arizona for Olin Mathieson's Plant Food Division. He was formerly field representative in Coolidge, Ariz.

Milton Roy Co. has assigned four new engineering representatives for controlled volume pumps and chemical instrumentation systems. They are: Brosey and Frew, Inc., Indianapolis, serving a major part of the Indiana area; Bernhard Engineering Sales Co., Dallas, serving North Texas; Tate Engineering, Inc., Richmond, for the state of Virginia; and Jay Instrument and Specialty Co., Louisville, for the central and southern part of Kentucky.

Stauffer Chemical Co. William H. Bigelow, associated with the company's sales department for 28 years, has retired and moved to Florida. He was a pioneer in the introduction of mineral feed supplements and founded the Chicago "Cowhand's Club," an organization which was active in the promotion of agricultural chemicals.

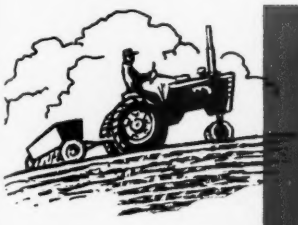

Bigelow

Joseph F. Luther has been appointed to the newly-created post of Technical Assistant to the vice president, sales, Industrial Chemicals Division. A graduate of Case Institute in Technology, he joined Stauffer in 1946.

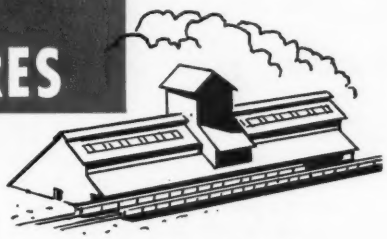
(Continued on page 22)

TENNESSEE CORPORATION

PRIMARY PRODUCERS OF FERTILIZER CHEMICALS



MANGANESE SULFATE
MANGANOUS OXIDE
COPPER SULFATE
ZINC SULFATE
IRON SULFATE
MINERAL MIXTURES



We have manufactured and maintained a consistant research program in the field of nutritional trace elements and their application to fertilizers for more than thirty years. Our background and basic position in this field is your assurance of a plentiful supply of quality materials.

YOU cut cost with combined carloads from one basic source.

YOU can save money, time, plant space and effort through the use of our custom formulated mineral mixture service.

WE back up our products with service, research and technical assistance.

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Make request on your Company letterhead for samples or literature.

TENNESSEE CORPORATION

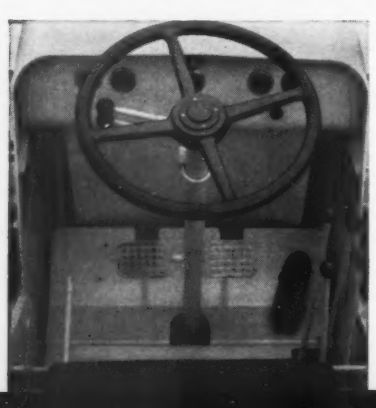
617-629 Grant Building, Atlanta, Ga.

If you had to drive a car for 8 solid hours in traffic like this . . .

would you be satisfied with an old fashioned gear shift?

Even an antique car enthusiast will have to admit that a manual gearshift is a tiresome business when you're caught in a traffic jam—when you have the constant clutching, and declutching and inching along in bumper-to-bumper traffic.

Did you ever recognize the similarity between a traffic jam and a typical bulk-handling job? In both cases, the runs are relatively short, constantly Stop and Go (and in bulk handling, constantly Forward and Backward). The automobile manufacturers long ago took this burden off the driver by giving him various types of "clutchless" transmissions. Now Clark has done the same thing for the industrial Tractor Shovel operator: Clark's exclusive Power-Shift transmission on the 16 cu. ft. MICHIGAN Model 12B.



No clutch pedal, no engine clutch

The small photo at left shows the operator's compartment of the MICHIGAN Model 12B. There's a double brake pedal—operate it with either foot. There's no clutch pedal, no engine clutch, no gear clash when shifting. This heavy-duty Clark transmission is as fast and as easy to operate as a modern car—the driver merely selects High-Low-Forward or Reverse and lets the Power-Shift transmission do the work. He can make any shift while moving in either direction.

Improves operator efficiency

Power-shifting drastically reduces operator fatigue. The MICHIGAN operator doesn't have to ride a clutch all day. He can work smoothly and easily through peak periods throughout the day and still be close to top efficiency when bulk-handling runs overtime. New operators can learn to run the MICHIGAN Model 12B in a few hours. And when several operators take turns on the MICHIGAN, the machine doesn't suffer—the hydraulic-operated Power-Shift transmission provides built-in protection against "clutch riders" and "cowboys."

See for yourself

Without any obligation, you can put the MICHIGAN Model 12B to work on any job in your own plant. We'll bet the MICHIGAN will outproduce any loaders in its size range, bar none. You be the judge. Clip the signature below to your letterhead and mail to us—we'll make the arrangements for an on-the-job demonstration.

Michigan is a registered trade-mark of

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2461 Pipestone Rd.
Benton Harbor 4,
Michigan

CLARK® EQUIPMENT

CALENDAR

Feb. 16-18. Seventh Annual Texas Agricultural Aviation Conference and Short Course on Pest Control, Texas A. and M. College.

Feb. 20-21. Nematology Workshop, Holiday Inn Motel, Toledo, Ohio. Sponsored by Shell Chemical Corp.

Feb. 20-22. Nitrogen Conf., Lowry Hotel, St. Paul, Minn. Sponsored by the Univ. of Minn. and the Minn. Fert. Industry Comm. of the Midwest Regional Office, National Plant Food Institute.

Feb. 28. California Forest Soils Fertilization Conf., Sonora, Calif.

Mar. 4-5. Western Cotton Production Conf., Hotel Cortez, El Paso, Tex.

Mar. 5. Spring meeting, Assn. of Consulting Chemists and Chemical Engineers. Shelburne Hotel, New York.

Mar. 11-12. Canadian National Packaging Conf., sponsored by the Packaging Assn. of Canada, King Edward Hotel, Toronto.

Mar. 18-19. South Dakota Weed and Pest Control Conf., City Auditorium, Miller, S. D.

Mar. 18-20. Western Weed Conf., Hotel Davenport, Spokane, Wash.

Mar. 26-28. Thirteenth Annual Conf., North Central Branch, Entomological Society of America. Sheraton-Jefferson Hotel, St. Louis, Mo.

April 11-19. International Horticultural Congress, Nice, France.

April 13-15. California Fertilizer Conf., State Polytechnic College, San Louis Obispo.

April 13-18. National meeting, American Chemical Society, San Francisco, Calif.

April 22. Spring meeting, Western Agricultural Chemicals Assn., Hotel Biltmore, Los Angeles, Calif.

April 30. Precautionary Labeling Conf., Shamrock Hotel, Houston, Tex. Sponsored by the Manufacturing Chemists' Assn.

June 9-11. Association of Southern Feed and Fertilizer Control Officials, Heart of Atlanta Hotel, Atlanta, Ga.

June 12. Fertilizer Safety Executive Comm., Hotel Roanoke, Roanoke, Va.

June 15-18. National Plant Food Institute, Greenbrier Hotel, White Sulphur Springs, W. Va.

June 22-27. Pacific Branch, Entomological Society of America, San Diego, Calif.

July 8-10. Pacific N. W. Fertilizer Conference, Pocatello, Idaho.

July 18-19. Southwest Fertilizer and Grade Hearing, Buccaneer Hotel, Galveston, Tex.

NEW granular triple

non-crumbling, free flowing ...and it ammoniates

Something new and different?

Yes . . . so new, in fact, there's no other granular triple super like it in the industry. The reason:

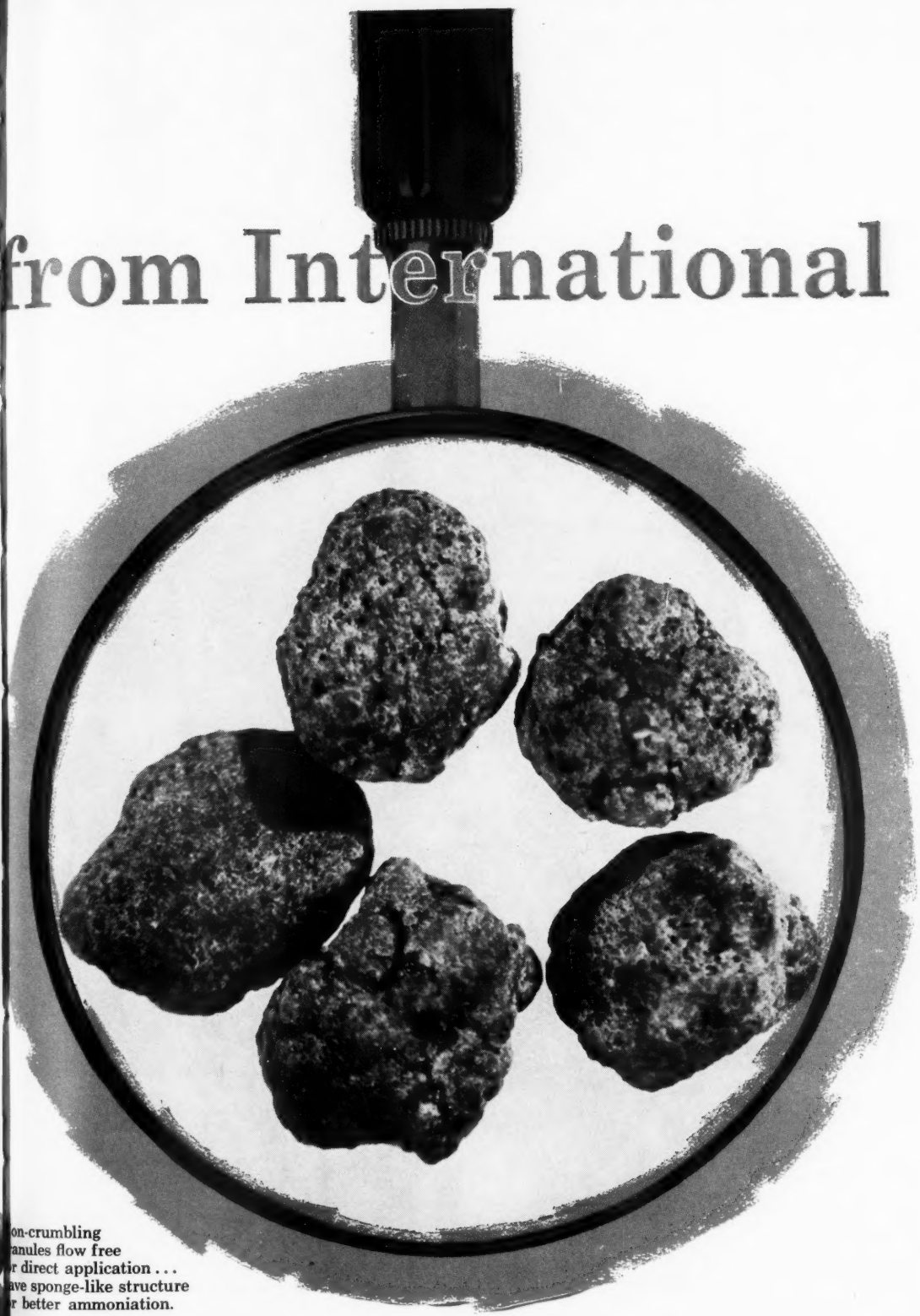
Every granule of International's new Triple Super has a unique sponge-like structure to *facilitate ammoniation* and contribute to desirable granular texture in your mixed goods. Yet each granule has plenty of strength to stand up without crumbling during handling.

Important, too . . . you can't beat this new granulated triple for *direct application.* It's packed with customer-pleasing qualities. International granules are non-crumbling . . . free flowing. They won't bridge over in a fertilizer drill . . . won't crumble during handling or spreading.

Have your International man show you how this new granular triple can help you widen your profit opportunities in manufacturing mixed goods . . . or when selling for direct application in bulk . . . or bagged under your own label as 0-46-0.

Write or wire for full information.

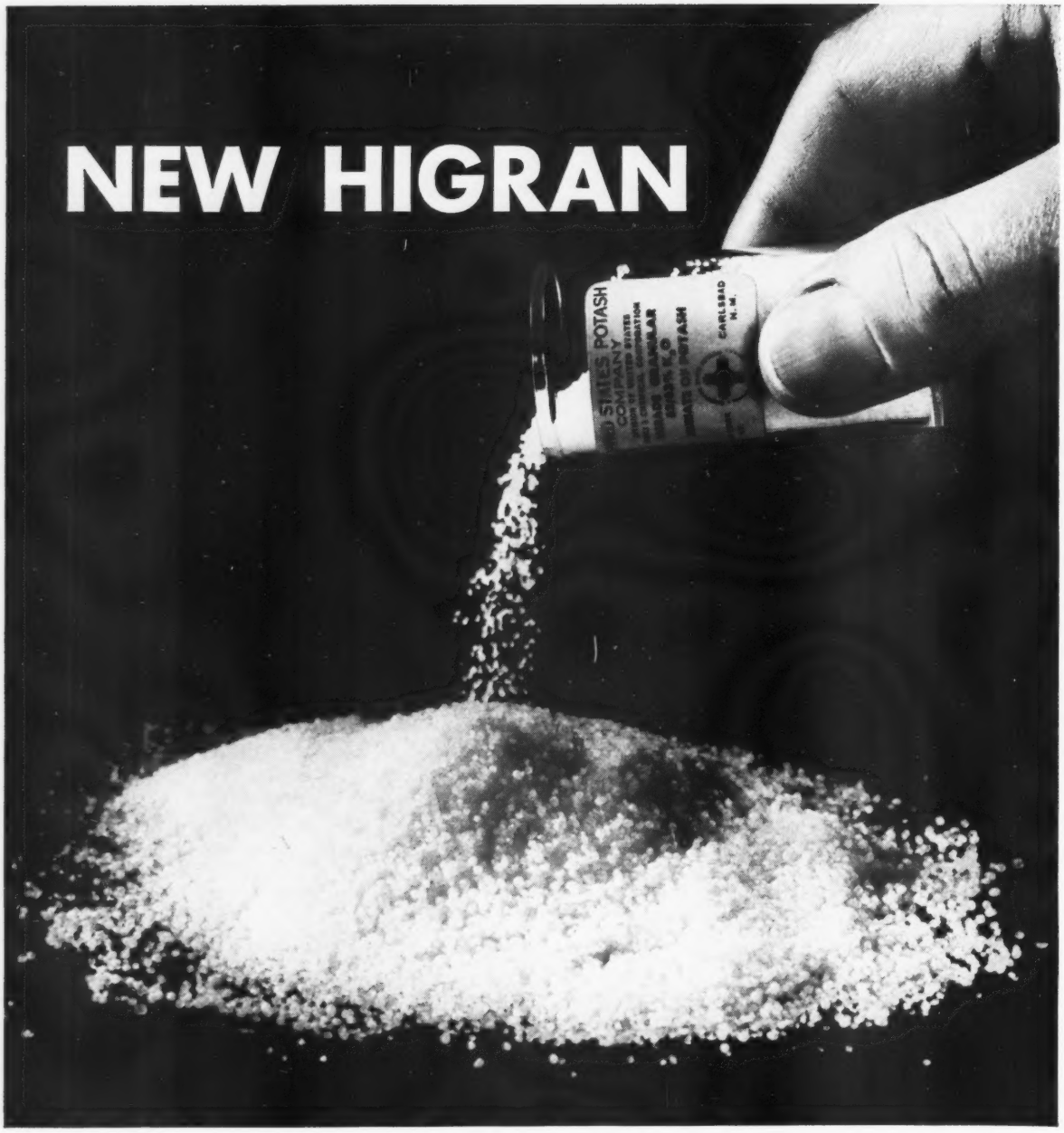
efrom International



on-crumbling
anules flow free
r direct application . . .
ave sponge-like structure
r better ammoniation.

NTERNATIONAL MINERALS *International* **& CHEMICAL CORPORATION**

PHOSPHATE CHEMICALS DIVISION . . . . . 20 N. WACKER DRIVE, CHICAGO 6, ILL.



USP'S NEW HIGRADE GRANULAR SPECIALLY SIZED FOR THE MANUFACTURE OF MODERN FERTILIZERS

USP announces the FIRST Higrade Granular muriate of potash designed specifically for the manufacture of today's modern fertilizers. Its perfect whiteness attests to its purity—the highest now available in granular agricultural muriate of potash. Non-caking and free-flowing throughout, USP's new Higrade Granular potash contains 62/63% K_2O! A regular supply of this important new potash product is immediately available from the U.S. Potash Co.

USP also offers Higrade muriate of potash—62/63% K_2O and Granular muriate of potash—60% K_2O—both free-flowing and non-caking.

UNITED STATES POTASH COMPANY
DIVISION OF UNITED STATES BORAX & CHEMICAL CORPORATION
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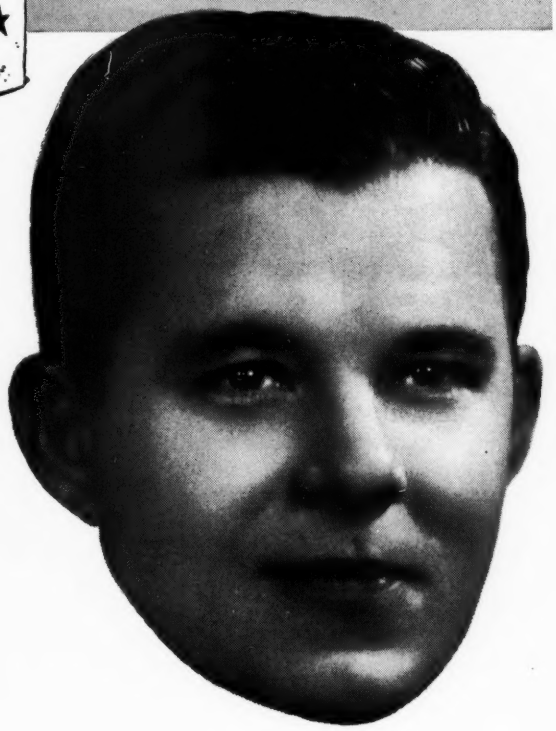
SUNSHINE STATE POTASH A PRODUCT OF NEW MEXICO U.S.A.
REG. U.S. PAT. OFF.

THE MAN WITH THE MULTIWALL PLAN



UNION PACKAGING ENGINEER ROBERT BOLLING

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Impressive savings in cost, space, handling and inventory control

A leading manufacturer of plant food has simplified his Multiwall inventory problem, reduced his packaging costs, released valuable storage space, and saved an impressive number of man hours by revising the Specifications Manual which guided his company's purchase of 20 million bags a year.

Union Multiwall Recommendations are based on this 5-point Packaging Efficiency Plan

- DESIGN
- EQUIPMENT
- CONSTRUCTION
- SPECIFICATION CONTROL
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The opportunities for more efficient control were first pointed out by Packaging Specialist Robert Bolling of Union. With the consent of the manufacturer, Bolling then surveyed the company's complete bagging operation. The new Specifications Manual was one of the results. Savings are expected to run well over $100,000.

Union Multiwall Specialists have helped many companies effect substantial economies and gains in Multiwall performance. Ask about Union's 5-Point Packaging Efficiency Plan, and how you can take advantage of it without either cost or obligation.

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VIEWING WASHINGTON

with Farm Chemicals Washington Bureau

on agriculture

Farm income in 1957 is forcing Secretary Benson to back up on recent claims that the farm income situation has "stabilized." This has been one of his major arguments in favor of still lower farm price supports. The January Demand & Price Report of the Agriculture Department shows net realized farm income at $11.9 billion, down from $12.1 billion in 1956 and $12.2 billion forecast by USDA last November. At this level, net farm income is at the lowest level since the $11.9 billion of 1943--with the single exception of $11.6 billion in 1955.

Income to farmers has been on the skids since 1952, according to President Eisenhower's Economic Report. In 1950, net farm income was $12.9 billion. It went to $14.8 billion in 1951, due to Korean war influences. In 1952, it was $14.3 billion; in 1953, $13.9 billion; in 1954, $12.2 billion; in 1955, $11.6 billion; then up to $12.1 billion in 1956; and down to $11.9 billion in 1957. The USDA holds out no hope that the down-trend will be halted this year.

The Benson farm plan, as presented by President Eisenhower to the Congress in a special message, warrants close scrutiny by the farm chemicals industry and other industries selling the farm market. The heart of it is this: Reduction of price supports for corn, cotton, tobacco, wheat, rice and peanuts to 60 per cent of parity. At the same time supports are reduced, acre allotments would be increased. The lower supports and bigger supply would force market prices down so that all supplies would be absorbed by the market.

The question is: Would this combination result in stimulation of farmers to spend more money on farm production items? Also would this approach provide farmers the opportunity to increase their net earnings? Further, would this approach be effective in shrinking production to the point where there would be no surpluses? Few economists outside the Agriculture Department agree affirmatively with Secretary Benson on any of these.

Congress is not buying the Benson-Eisenhower plan. This is shown clearly by the attitude of both the House and Senate Agriculture Committees. A poll of both committees reveals that the Republican Party regulars themselves feel a vote for the plan would amount to political suicide at the polls. For example, Senator Aiken of Vermont, the Administration's anchor-man on farm programs, has for the first time declared himself publicly as opposed to reducing supports below the present 75 per cent of parity floor. Florida Democratic Senator Holland, who says he agrees with the lower support plan generally--disagrees sharply on Benson's intention to include tobacco in the general reduction.

Will any other price support legislation be enacted? Unless some dramatic and entirely unexpected development occurs,

VIEWING WASHINGTON

agriculture continued

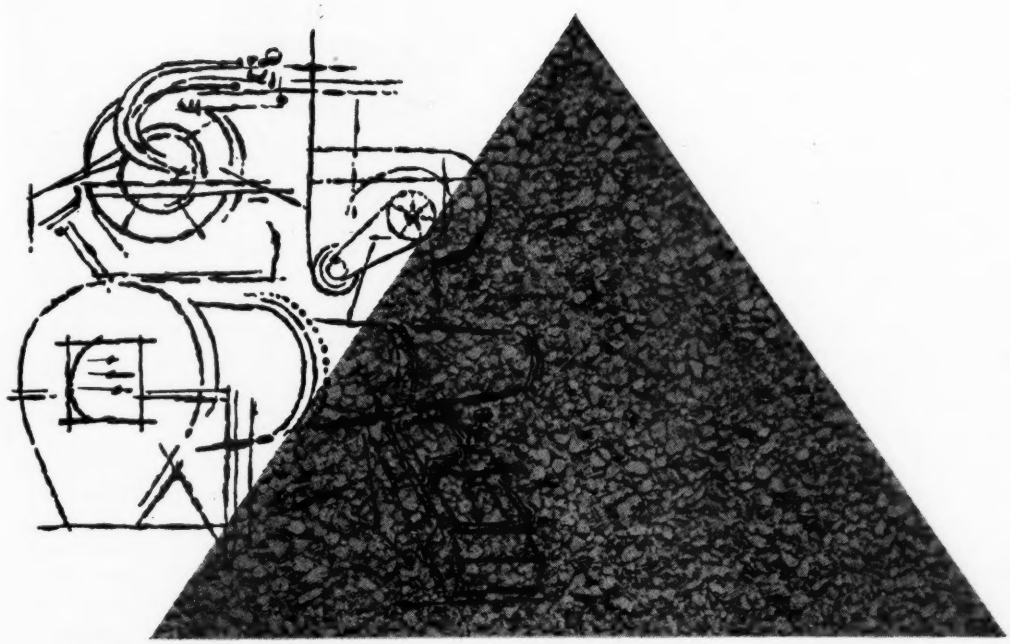
observers in Washington predict not. Most lawmakers themselves indicate a resignation to a "hold-the-line" policy. A program not including the Benson plan, it is believed, would run into almost certain veto at the White House. This applies primarily to the basic question of general price support policy. Other changes requested by the President could conceivably be put through.

Congressional pre-occupation during the early weeks of the present session was on combatting "bad publicity" given farm programs in the consumer press. This was demonstrated from the start in the Senate Agriculture Committee when it gave Secretary Benson one of the roughest treatments given a cabinet member in memory. Benson said the price support program cost taxpayers $3.2 billion last year. Committee Chairman Ellender declared the figure was "loaded" with items which can't be charged to the program, and said the loss was more like $750 million.

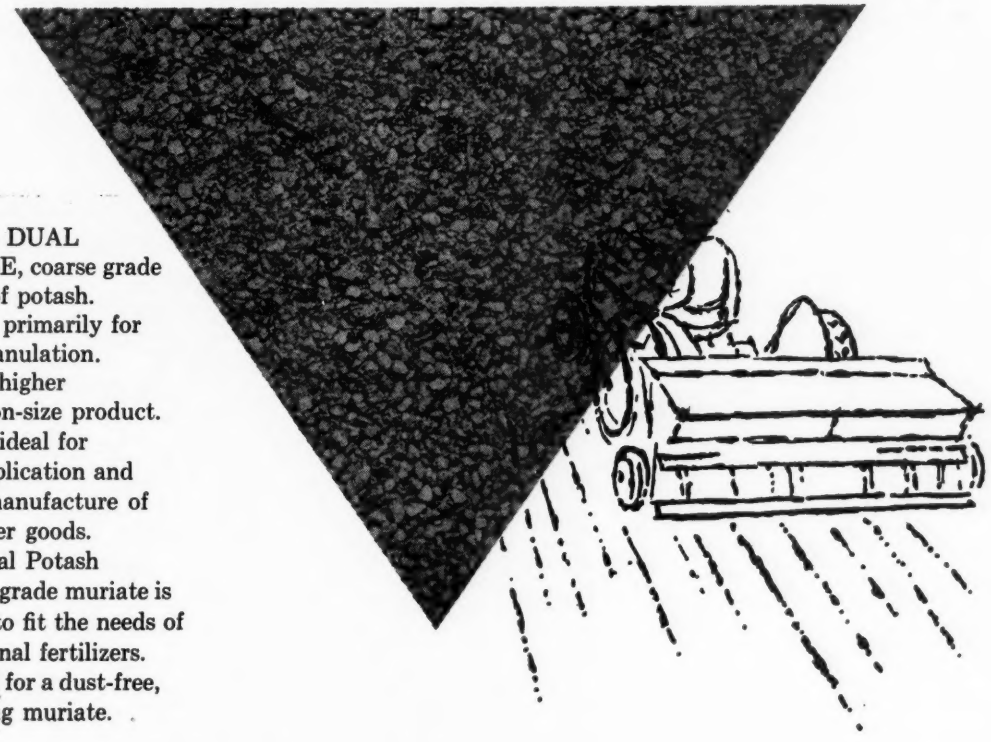
The President's farm budget also came under heavy fire from farm state lawmakers for the type of cuts proposed. The budget calls for reducing farm spending from $5.3 billion to slightly less than $5 billion. Among the proposed cuts was one on the Agricultural Conservation Program (ACP), which would be reduced from the present $250 million to $125 million. Payments for fertilizer and lime practices would be eliminated. The TVA budget for fertilizer research would be increased from $1.5 million this year to $1.6 million for the year beginning July 1.

The Soil Bank's 1958 Acreage Reserve--which pays farmers high rates for not planting corn, cotton, wheat, rice and tobacco for one year--caught on like wild fire this year. USDA officials were amazed to discover that the $500 million program was almost completely committed after only a few weeks of the 2-month sign-up period. Reasons for the sudden popularity were combinations of bad fall weather, concern about 1958 conditions, plus the general knowledge that this would be the last year the program would be available. The President asked that it be killed off after this year because of general failure in reducing surplus production, and Congress has indicated it will comply with the request.

What is the relation of farmer income to farm investment? The Agriculture Department has just completed a study of this question--and come up with some rather startling conclusions. Depending upon the region and type of farming operation, a farmer must invest $14,000 to $89,000 in order to realize a return of $2,500 for labor and management. The detailed conclusions of the study are useful in determining safe credit commitments. Single copies of "Farm Resources Needed for Specified Income Levels," AIB 180, are available free on request from Office of Information, USDA, Washington 25, D. C.



LET NATIONAL POTASH SERVE YOU



Here is a DUAL PURPOSE, coarse grade muriate of potash. Designed primarily for use in granulation. It gives a higher yield of on-size product. It is also ideal for direct application and for the manufacture of top dresser goods.

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PEOPLE (*from page 10*)

The Texas Co. Several new positions have been created in the company's domestic sales department. Appointed to the posts are: W. B. Hawke, general sales manager (merchandising); C. H. Dodson, general sales manager (wholesale); Ben Halsell, director of advertising and sales promotion. In addition, J. E. Fritts was named assistant general sales manager (merchandising) and R. W. Debnam, assistant general manager (wholesale).

Union Carbide Chemicals Co., division of Union Carbide Corp., has transferred H. L. Vincent, Craig Agricultural Chemicals sales representative from the Eastern Gulf Coast states to Southern Texas. His territory will extend from the Rio Grande Valley, north into the Brazos River bottom.

Vincent

United States Potash Co., division of the United States Borax and Chemical Corp., has announced the appointments of John E. Fletcher as vice president and sales manager of the division and of Earl H. Miller, vice president and resident manager in Carlsbad, New Mexico. Fletcher has been with the company since 1949; Miller since 1951.

Velsicol International Corp. Bernard Willis has joined the corporation as liaison with U. S. suppliers for worldwide distribution. His headquarters will be in New York City.

Willis is a member of the Institute of Directors (London) and the Chemical Institute of Canada.

Woodward & Dickerson E. V. Linson and L. McLean have joined the staff of this Philadelphia firm. Both men have had experience handling food stuffs, fertilizers and chemicals.

FARM CHEMICALS — Associations & Meetings

CANADIAN INSTITUTE NAMES NEW MANAGER

The Chemical Institute of Canada has appointed T. H. Glynn Michael general manager and secretary. Michael replaces Garnet T. Page, who is now with the Engineering Institute of Canada in Montreal.

Formerly director of research, Howard and Sons (Canada) Limited, Michael will serve as executive officer of the Institute under the direction of the board of directors. He will be responsible for the administration of the numerous services provided by Institute's head office in Ottawa. In addition, he will serve as managing editor of the C. I. C. publications, "Chemistry in Canada" and the "Canadian Journal of Chemical Engineering.

NITROGEN CONFERENCE SET FOR FEB. 20-22

The University of Minnesota and the Midwest Regional office of NPFI will sponsor a three-day session on the importance of nitrogen fertilizer on February 20–22, St. Paul, Minn.

Dr. W. P. Martin, head of the university's Soils Department, and J. W. Hicks, International Minerals and Chemical Corp., will serve as co-chairmen of the conference which will feature a roundup of information on how nitrogen can be used to increase farm products. Dr. Malcolm H. McVickar, California Spray-Chemical Corp., will be the keynote speaker. He will discuss "How Can We Work as a Team to Put Soil Fertility Facts to Work on the Farm."

NPFI PERSONNEL DISCUSS FUTURE PROGRAMS

Newly appointed National Plant Food Institute regional personnel met recently to discuss future plans. Shown with Dr. Russell Coleman and Paul T. Truitt (seated left to right) are executive vice presidents Zenas H. Beers, who will be Midwest regional director; Dr. W. H. Garman, chief agronomist and Northwest regional director; Dr. Samuel L. Tisdale, Southeast regional director; F. Todd Tremblay, Pacific northwest representative; Dr. Richard Bahme, California and Arizona representative; and Dr. Robert L. Beacher, Southwest regional director.

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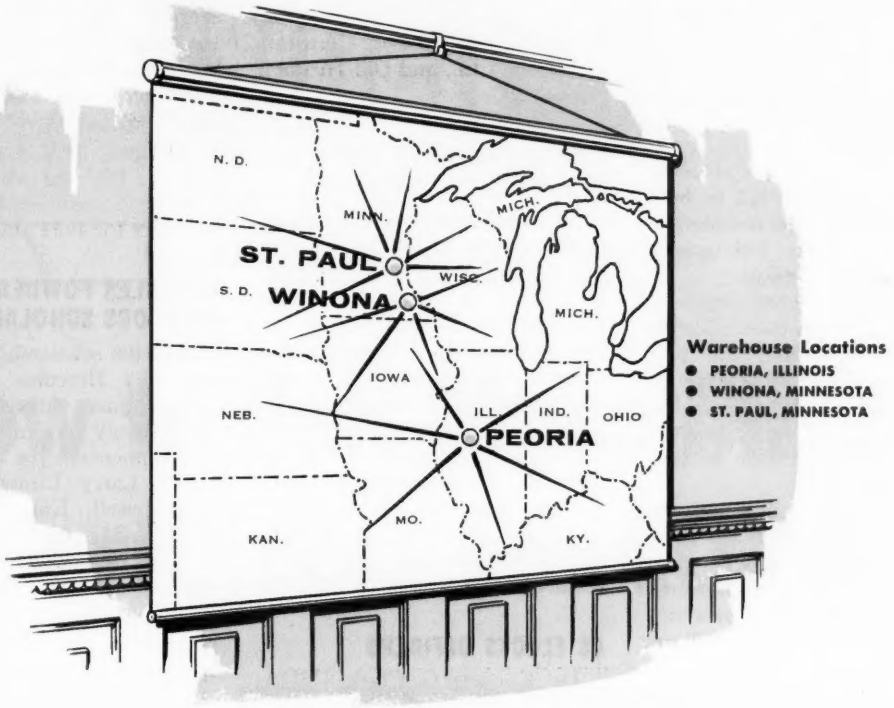

Warehouses centrally located at St. Paul, Minnesota, Winona, Minnesota, and Peoria, Illinois, have been established by U.S.P.P. to better serve the fertilizer industry . . . Improved delivery when you need it most . . . quality being constantly improved through research . . . many other advantages are yours when you buy U.S.P.P.

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FARM CHEMICALS

— *Associations & Meetings* —

CFA CONFERENCE SLATED FOR APRIL 13-15

The Sixth Annual California Fertilizer Conference will be held April 13, 14 and 15 on the campus of California State Polytechnic College, San Luis Obispo.

Sponsored by the Soil Improvement Committee of the California Fertilizer Association, the program will be general in scope of coverage, but will lean somewhat toward range fertilization because of the work being done in that field by Cal-Poly.

The conference will get under way on Sunday evening, April 13, when the Soil Improvement Committee will sponsor its annual joint dinner with the University of California Fertilizer Committee. Current problems and new research techniques will be discussed.

On the following morning, the entire group will attend a program of formal papers on fertilizer use. In the afternoon, they will tour field-size range fertilization test plots and then will attend the annual conference banquet.

Panels on "Range Fertilization" and "Crop Response to Sulfur in California" will be held Tuesday morning.

STAUFFER PRESIDENT ELECTED TO NICB

Hans Stauffer, president of Stauffer Chemical Co., has been elected a board member of the National Industrial Conference Board.

Founded in 1916, the National Industrial Conference Board, is an independent non-profit institution for business and industrial fact finding through scientific research. The organization has more than 3,600 subscribing associates including business organizations, trade associations, government bureaus, labor unions, libraries, individuals, and colleges and universities.

Stauffer is also a director of Greyhound Corp., Western Phosphates Inc., Montrose Chemical Co., of California, Philadelphia Quartz Co., of California, San Francisco Chem. Co., Cornwall Chemicals Ltd., and Old Hickory Chemical Co.

BANKING GROUP & NPFI SPONSOR ADV. PROGRAM

The agriculture committee of the Maryland Bankers Assn. and the National Plant Food Institute have joined in a program promoting the use of advertising by banks to point up the need and the importance of following sound land management practices. The advertisments will stress the need for soil testing, point to the importance of fertilizers in lowering the per unit cost of production and to the general need to follow recommendations of agricultural scientists.

CS ELECTS OFFICERS

Dr. Kenneth G. Clark, USDA, has been elected chairman of the American Chemical Society's Division of Fertilizer and Soil Chemistry for 1958. Dr. Clark, senior chemist with the Soil and Water Conservation Branch of the department's Bureau of Plant Industry, succeeds Dr. Stacy R. Randle, of the New Jersey Agricultural Experiment Station.

A government chemist for 33 years, Dr. Clark is an authority on fertilizer technology and has carried out research on conditions affecting the efficient use of ammonia compounds in fertilizer agents.

M. Dwight Sanders, director of research of Swift and Co.'s Plant Food Division, was chosen chairman-elect and Travis P. Hignett, of the Tennessee Valley Authority, was named division secretary.

SAACI NAMES '58 OFFICERS

Robert J. Roberts, of Emery Industries, Inc., has been selected by the nominating committee of the Salesmen's Association of the American Chemical Industry as its candidate for election to president of the association for 1958.

Other committee nominations for 1958 officers include: vice-president, James E. Spencer, Harshaw Chemical Co.; treasurer, George W. Poland, Jr., E. M. Sergeant Pulp and Chemical Co., Inc.; secretary, Preston F. Tinsley, Westvaco Chlor-Alkali Div., Food Machinery and Chemical Corp.

In addition, A. C. Curran, N. M. Draper, A. R. Kavaler, S. F. Teague, Jr., and M. Testa, Jr., have been nominated to serve as directors for 1958 and 1959.

HERCULES POWDER CO. SPONSORS SCHOLARSHIPS

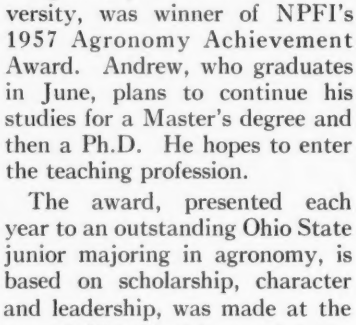
Six $400 scholarships were provided by Hercules Powder Co. to the winners of the National 4-H Entomology Awards Program. The winners are Joe W. Simmons, Calif.; Larry Ulmer, Jr., Del.; Jack Jewell, Kan.; Howard E. Breland, Miss.; Jesse Malone, Jr., Mont.; and David C. Johnson, Va.

This is the sixth year of competition in the awards program, sponsored by Hercules.

OHIO STUDENT HONORED

Robert W. Andrew, a student in agronomy at Ohio State University, was winner of NPFI's 1957 Agronomy Achievement Award. Andrew, who graduates in June, plans to continue his studies for a Master's degree and then a Ph.D. He hopes to enter the teaching profession.

The award, presented each year to an outstanding Ohio State junior majoring in agronomy, is based on scholarship, character and leadership, was made at the annual Ohio fertilizer and Lime Conference held in December.



Robert W. Andrew, receiving NPFI award from Z. H. Beers, Midwest Regional Director of the Institute. Looking on is Dr. Garth W. Volk, chairman of the Department of Agronomy of the University.

Arcadian® News

Volume 3 | For Manufacturers of Mixed Fertilizers | Number 2

How to Sell More Mixed Fertilizers for CORN

Corn is the biggest single market for fertilizer in this country. Every state grows corn. More fertilizer is used on corn than on the next four crops combined. Yet many fertilizer manufacturers are not taking full advantage of this market because they do not produce mixed fertilizers which supply the complete plant food needs of corn. Farmers are forced to use heavy applications of nitrogen, in addition to mixed fertilizers, to grow big yields.

You can capture more of this market for mixed goods by producing and selling high-analysis, high-nitrogen fertilizers for corn. It takes 160 pounds of nitrogen, 60 pounds of phosphoric acid and 120 pounds of potash to grow 100 bushels of corn. Yet some fertilizer manufacturers are still promoting a 1-4-4 ratio for corn.

It is true that the fertilizer analysis cannot be based on actual plant food removal. More phosphorus is needed because part of the phosphorus is changed in the soil to forms not immediately available. Less potash may be needed because much potash stays in the stalks which are plowed down.

Stalks also contain nitrogen, but to speed the breakdown of old stalks and roots into nitrogen-rich, potash-rich organic matter, fertilizer nitrogen is needed to feed the soil organisms that do the job.

About 20 pounds of nitrogen per ton of stalks is the accepted figure, and a 100-bushel crop produces 3 to 4 tons of stover and roots.

In any event, corn is a crop that requires plenty of nitrogen to produce profitable yields. Why not recognize this fact and sell high-analysis, high-nitrogen fertilizers for corn. More and more manufacturers are increasing their profits by selling 2-1-1 ratios, such as 16-8-8, 14-7-7, 12-6-6 and 10-5-5, as plow-down fertilizers for corn. High-nitrogen mixed fertilizer plowed down in the fall or spring, followed by the proper mixed fertilizer at planting time, can supply the total plant food needs of corn with mixed fertilizers.

Good farmers are going to use plenty of nitrogen on corn. It will pay you to sell this nitrogen in mixed fertilizers. For information on how to make high-nitrogen fertilizers, turn the page . . .

Arcadian News for Fertilizer Manufacturers . . . . . from NITROGEN DIVISION

How to Make High-Nitrogen Mixed Fertilizers for Corn

Most farmers who produce big yields of corn are big users of nitrogen. If you add together the total plant foods they use on the crop, including mixed fertilizers and straight materials, you'll often discover a 2-1-1 ratio or a similar high-nitrogen combination. So why not put this combination in your fertilizer bag and supply the needs of corn with mixed fertilizer?

The new trend in mixed fertilizers for corn is toward high-nitrogen ratios for two reasons: 1) Corn needs high-nitrogen fertilizers to produce profitable yields. 2) The new ARCADIAN® Nitrogen Solutions make it easy and practical to formulate high-analysis, high-nitrogen mixed fertilizers in almost any plant.

The trend is obvious. Where 1-4-4 and other low-nitrogen analyses once were predominant, 1-1-1 ratios have become important and some manufacturers are having outstanding success with 2-1-1 ratios, such as 16-8-8, 14-7-7, 12-6-6, and 10-5-5. Why not take advantage of this trend to build your own sales and profits?

As a result of the development of modern ammoniating solutions, high-nitrogen fertilizers are now much easier to make in regular mixing equipment. One successful method uses URANA® or NITRANA® Solutions which are high in nitrogen and low in free ammonia. These solutions, plus sulphate of ammonia, are enabling mixers to put a high-nitrogen content into good quality mixed fertilizers.

Another practical method uses URANA or NITRANA Solutions with a high content of free ammonia, with the addition of sulphuric acid in the mixing. This amounts to making your own sulphate of ammonia during the mixing process.

Either method will produce good quality, high-analysis fertilizers with real economy. The best method for you to use depends on plant equipment, cost of materials, and the actual ratios you wish to produce. Your Nitrogen Division technical service representative can be helpful to you in selecting the method best adapted to your particular needs.

Production of high-nitrogen mixed fertilizers for corn and other crops will enable you to supply a bigger share of your customers' total fertilizer needs with mixed fertilizers. You will also be in a better position to increase your sales of actual plant food, with lower freight rates and greater profits.

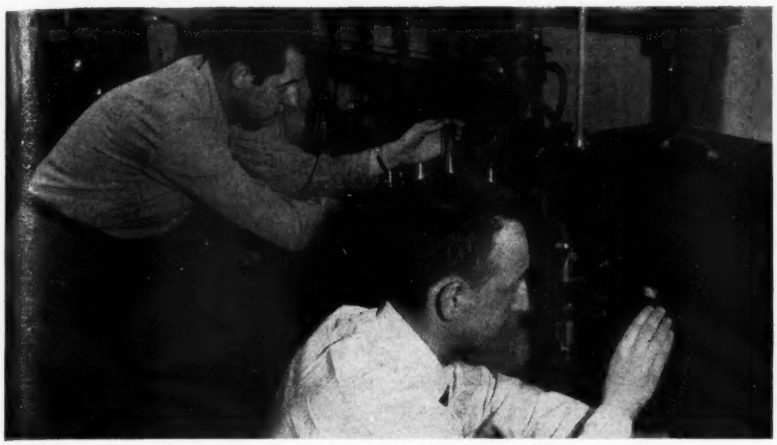
For technical help on the production of high-nitrogen fertilizers in your plant, contact Nitrogen Division, Allied Chemical, 40 Rector Street, New York 6, N. Y. This service is available to customers, without charge.

EVERY FIELD A DEMONSTRATION PLOT!

One of the best ways to demonstrate the value of fertilizer is to persuade farmers to run their own simple fertilizer tests. Suggest to the farmer that he use no fertilizer on one strip across his field. This makes a check strip. Then tell him to double the usual fertilizer application on the next strip. Then use his normal fertilizer application on the rest of the field. Time spent in getting farmers to run these simple tests will pay off in extra sales. The photo above shows a wheat field where one strip got no fertilizer. There is a big difference in the rest of the field where fertilizer was used. But, remember this! Many farmers, even when they follow state recommendations, are not using enough fertilizer for maximum yields and profits. A strip with double the usual fertilizer application is often one of your best sales tools!

Survey Results Now Available

A report has been prepared based on the results of a new and intensive survey to determine motivations that influence farmers' fertilizer buying habits. This personal-interview survey was conducted by an independent research organization employed by Nitrogen Division, Allied Chemical. *Part 1* of the findings of this survey is now available for distribution. It contains significant new information of interest to fertilizer manufacturers. To obtain a free copy, simply request *Farm Fertilizer Survey, Part 1* from Nitrogen Division, 40 Rector Street, New York 6, N. Y. Your copy will be mailed to you promptly.



ANALYZING FERTILIZERS for PLANT FOOD CONTENT

It is vital to your business to make sure that control officials find correct analyses when they examine your fertilizers. You may formulate with the right amounts of ingredients, using good machinery and skilled operators, but if your fertilizers fail to meet minimum guarantees you are in trouble.

Nitrogen Division has conducted extensive research in the development of more efficient methods for determining the plant food content of fertilizers.

Part of this research has been devoted to the sampling of ammoniating solutions. A "squeeze bottle" method invented by a Nitrogen Division chemist proved to be outstanding in simplicity and accuracy. Presented at the 1956 meeting of the Association of Official Agricultural Chemists, this method is winning rapid acceptance.

Some problems require the united efforts of many chemists. Nitrogen Division cooperates fully in this work.

In analyzing fertilizers high in both nitrate and chloride, such as many 10-10-10's and 12-12-12's, chemists knew they were losing nitrogen during the Kjeldahl digestion because they saw brown fumes escaping. The reduced iron method was devised to avoid this loss, and given official status by the A.O.A.C., after cooperative testing in which Nitrogen Division chemists participated. In addition to providing better analysis of 1-1-1 ratios, this method is also helpful in analyzing nitrogen solutions that contain urea.

Sometimes it is necessary to determine distribution of nitrogen in different forms, as well as finding total nitrogen content. As a special case, there may be interest in the amount of biuret. Confronted with this problem, Nitrogen Division chemists studied known procedures and then developed a more accurate method. Published in 1955, this method is now generally accepted. Work is now under way to apply this procedure to complete fertilizers.

About two years ago, analytical difficulties were noted in lawn fertilizers containing a natural organic, such as activated sewage sludge, along with urea. Analyses were consistently a fraction lower than expected in water-soluble organic nitrogen. Were the analytical methods at fault or was part of the organic nitrogen converted to ammoniacal nitrogen in the manufacturing process?

To find the answer, blends of ingredients were made in the Nitrogen Division laboratory and 8-6-4 and 10-6-4 were produced on a small scale for testing. Standard analyses were made and separate direct analyses were run for urea. Samples contained practically all of the expected urea. Even when samples were kept for a month at 122°F. the urea nitrogen content had decreased only slightly.

These tests showed that an *apparent* loss of organic nitrogen, with offsetting higher values of ammoniacal nitrogen, was due to conversion of part of the urea to ammonia during the analysis and, to a slight extent, by conversion of some natural organic to ammonia. It was found that these discrepancies could be minimized by close attention to analytical detail. For best results, a milder procedure for determining ammoniacal nitrogen was recommended.

In the direct determination of urea content, the basic procedure involves the enzyme urease which splits urea into ammonia and carbon dioxide. Nitrogen Division chemists have found a simple way to apply this procedure to mixed fertilizers, avoiding the interference generally caused by phosphate.

These are only a few of the many ways that Nitrogen Division chemists are working to improve old analytical procedures and devise new ones as required. With fertilizer technology now in a state of rapid change, continuing research is vitally important in solving the problem of meeting minimum guarantees.

200 NEW TANK CARS. To expedite delivery of Nitrogen Solutions to mixed fertilizer plants, Nitrogen Division, Allied Chemical, is adding 200 new units to its large fleet of tank cars. All of these new cars, made of aluminum and especially designed for handling all types of Solutions, will be in service this month. Another way that Nitrogen Division, Allied Chemical, is constantly expanding its facilities and improving its service to customers.

HERE'S THE BIG LINE OF Arcadian NITROGEN SOLUTIONS

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	26
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.188	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.052	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
10	44.4	24.5	56.0	10.0	9.5	11.0	1.108	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.081	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.925	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.972	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	—

Other ARCADIAN® Nitrogen Products: UREA 45 • A-N-L® Nitrogen Fertilizer Ammonium Nitrate • American Nitrate of Soda • Sulphate of Ammonia

NITROGEN DIVISION Allied Chemical & Dye Corporation

MAIN OFFICE: 40 RECTOR STREET, NEW YORK 6, N. Y., PHONE HANOVER 2-7300

Hopewell, Va., P. O. Drawer 131.....Cedar 9-6301
Ironton, Ohio, P. O. Box 98.....Ironton 8-4366
Omaha 7, Neb., P. O. Box 166.....Bellevue 1464
Raleigh, N. C., 16 W. Martin St.....Temple 3-2801
Columbia 1, S. C., 1203 Gervais St.....Alpine 3-6676
Atlanta 3, Ga., 127 Peachtree St., N. E. Jackson 2-7805
Memphis 9, Tenn., 1929-B South 3rd St. Whitehall 8-2692
Columbia, Mo., P. O. Box 188.....Gibson 2-4040
Indianapolis 20, Ind., 6060 College Ave. Clifford 5-5443
Kalamazoo, Mich., P. O. Box 869.....Kalamazoo 5-8676
St. Paul 4, Minn., 45 N. Snelling Ave.....Midway 5-9141
San Francisco 4, Cal., 235 Montgomery St. Yukon 2-6840

Chemicals

28—BALANCED EMULSIFIERS

A new pair of balanced agricultural emulsifiers has been announced by Theodore Riedeburg Associates. The firm states that its Agrem 102 and Agrem 103 can be blended together to produce outstanding emulsions of both insecticides and herbicides.

The company welcomes inquiries about the emulsifiers and will send you descriptive material if you

CIRCLE 28 ON SERVICE CARD

29—POLYETHYLENE GLYCOLS

Of interest to the industry is the fully illustrated and detailed 54-page booklet on the properties, applications, storage, specifications and testing of Carbowax polyethylene glycols published by Union Carbide Chemicals Co., division of Union Carbide Corp. The glycols are water-soluble, non-volatile, unctuous liquids and solids used for water-soluble lubricants, cosmetics and ointments, emulsifying agents, adhesives, and paper coatings.

The book contains data for potential users and a table of physical properties including solubilities in common solvents and compatibilities with common ingredients of formulated products. Shipping data is condensed in a full-page table. Copies of the booklet may be obtained by

CIRCLING 29 ON SERVICE CARD

30—BENZYL CHLORIDE DATA SHEET

The Manufacturing Chemists' Association has just published a new safety data sheet on benzyl chloride.

The 16-page booklet contains updated information on properties, hazards, control, employee safety, fire fighting, handling and storage, cleaning and repair, waste disposal, medical management and first aid. For your copy of the data sheet,

CIRCLE 30 ON SERVICE CARD

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FREE INFORMATION to help you solve fertilizer, pesticide problems

Reader Service

31—COMPANY ISSUES PRICE LIST

Crippen & Erlich Laboratories, Inc., subsidiary of Foster D. Snell, Inc., recently issued a four-page price list. Included are prices of insecticide and fungicide analyses, agricultural products including herbicides, and fertilizers, and special services. To secure the list,

CIRCLE 31 ON SERVICE CARD

32—CHIPMAN CITRUS CHEMICALS

Chipman Chemical Co. is recommending its Chipman 6199 for use on non-bearing citrus. To give salient facts concerning the product, Chipman has issued a technical service bulletin which tells what the chemical is, how it should be used, methods of application and information on spray equipment. For a copy,

CIRCLE 32 ON SERVICE CARD

33—PESTICIDE SAFETY CHART

The problem of toxic pesticide handling is treated pictorially in a chart released by Willson Products Division.

The chart which illustrates 12 safety tips is yours by

CIRCLING 33 ON SERVICE CARD

34—PEST CONTROL

A new 32-page booklet being distributed by Phelps Dodge Refining Corp. describes plant insects, animal pests and gives instructions for proper control. A copy of "Controlling Plant and Animal Pests in Farm Ponds With Copper Sulfate" will be sent if you

CIRCLE 34 ON SERVICE CARD

35—GIBBERELLIN REVIEW

Research workers, county agents and others with a technical background will be interested in the 18-page technical bulletin issued by Merck & Co. reviewing the latest research findings on the uses of the gibberellins. The bulletin contains an annotated bibliography of 188 pertinent scientific papers.

Merck, which produces the plant growth stimulant under the registered trademark "Gibrel," has made more than 30 grants-in-aid to agricultural experiment stations to study the effect of the product on crop plants. The bulletin is part of the company's program to keep the public informed on progress being made at stations which are testing the new compound. To secure a copy,

CIRCLE 35 ON SERVICE CARD

Materials Handling

36—LEWIS-SHEPARD OFFERS CIRCULAR ON FORK LIFT

Lewis-Shepard has developed a new Model "H" electric fork lift truck. Offered in capacities from 1000 to 2500 pounds with a 24-volt electrical system, the model will pass under 6-foot doorways with a 68-inch collapsed height. To further describe the new truck, the company has issued a fully-illustrated 6-page, two color circular which may be secured by

CIRCLING 36 ON SERVICE CARD

37—STRADDLE CARRIER

Ross Carrier Div., Clark Equipment Co., is offering its Series 71 straddle carrier. Of 12,000 lbs. capacity, the carrier is obtainable in nine models. The carrier's complete specifications and operating advantages are delineated in a 4-page, two color brochure which lists dimensions as load heighth and width, bolster length, inside heighth and width, overall width and weight. For your copy,

CIRCLE 37 ON SERVICE CARD

38—PAYLOADERS UP PRODUCTION

Many plants have testified that they get more and better performance from Payloader tractor-shovels, reports The Frank G. Hough Co. One fertilizer plant superintendent speaking of the new style model HA says, "Roll-back, breakout bucket action and torque converter drive is an ideal combination. Production increased 30 per cent along with lower maintenance and less tire wear and less operator fatigue."

For information on what the new HA (2,000 lb. carry) and larger HAH (3,000 lb. carry) can do for you,

CIRCLE 38 ON SERVICE CARD

Process Equipt.

39—CUSTOM FABRICATION OF PROCESS EQUIPMENT

Niagara Welding & Boiler Works Inc., an equipment fabricator for the chemical, process, food, beverage, pharmaceutical, and other industries, has described its facilities, services and qualifications in a new illustrated bulletin. For more information on the plant, just

CIRCLE 39 ON SERVICE CARD

40—MECHANICAL MIXER

Members of the fertilizer industry will be interested in the mechanical mixer for dry materials manufactured by the Buflovak Equipment Div., Blaw-Knox Co. According to the concern, the machine quick mixes any number of dry materials in any proportion by precessional motion of a revolving screw flight moving inside an inverted cone body. For a fuller explanation of the mixer,

CIRCLE 40 ON SERVICE CARD

41—METERING PUMP

Milton Roy Co., manufacturing engineer of chemical instrumentation systems including controlled volume pumps, has just published a new bulletin dealing with its metering pump with diaphragm liquid end. For your copy of the bulletin which also describes the features of the pump including the mechanical actuation for correcting the volume of hydraulic fluid between each stroke,

CIRCLE 41 ON SERVICE CARD

Packaging

42—BEMIS BAGGER

A new bagger which fills bags with pelleted, granular and meal type fertilizers at speeds up to 24–100 lb. bags per minute, has been introduced by Bemis Bro. Bag Co. The company has issued a 4-page bulletin describing the new Rapid-Weigh Bagger in detail which may be secured by

CIRCLING 42 ON SERVICE CARD

43—CHASE INTRODUCES NEW BAG PACKER

A new bagging unit for the fertilizer industry is being distributed by Chase Bag Co. Named the "Southland Packer," it is described as a completely automatic, all-electric device for filling and weighing open mouth textile or multiwall paper bags. Full information is available by,

CIRCLING 43 ON SERVICE CARD

44—PAPER SELECTOR

St. Regis Paper Co. has made available an additional quantity of its paper selector for multiwall paper bags. With the selector, it is possible to determine the type of paper best suited to meet individual multiwall bag packaging requirements.

For your selector which indicates which papers provide protection against grease and oil, acid and alkali, scuff and abrasion, bacteria and insects, moisture vapor and water damage,

CIRCLE 44 ON SERVICE CARD

Miscellaneous

45—AIR CARRIER SPRAYING

A folder, "What You Should Know About Air Carrier Spraying of Row Crops," has been prepared by the Besler Corp., manufacturers of air carrier sprayers. Copies of the folder are available by

CIRCLING 45 ON SERVICE CARD

46—TRIGGER VALVE

Spraying Systems Co. has devised a new trigger valve for use with turn-handle type spray guns. The company assures users that positive shut-off is provided for pressures up to 800 psi. The valve is also supplied with adapters for directly connecting nozzles and extensions to make a spray gun. More information is yours if you

CIRCLE 46 ON SERVICE CARD

47—"INFRARED NOTES"

Beckman/Scientific Instruments Div. is offering a comprehensive, illustrated 4-page brochure on the double-beam IR-5 Spectrophotometer for routinely running infrared analyses. Also described are the uses and applications of the Beckman IR-4, customer training and accessories of the IR-4; and complete lists of new literature covering spectrophotometry, *p*H-electrochemical and gas chromatography. For your copy,

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48—SALES-BUILDER PROGRAM

Velsicol Chemical Corp. has announced its 1958 promotional Heptachlor Insecticide Program to increase dealer sales. The '58 program will include an informative "salesman's insect control refresher course" whereby dealers will be provided with information that will enable them to discuss insecticides with authority and intelligence. Included will be "down to earth" sales techniques.

Each month, dealers will receive helpful technical and promotional material including an insect control guide sheet containing material about crop pests common to their part of the country. Also, dealers participating in the program will receive a free listing in any Velsicol advertising run in their local areas. Those interested in securing information to enable their dealers to participate in the program, should

CIRCLE 48 ON SERVICE CARD

49—POTENTIOMETERS

A recent announcement by the Bristol Co., reports that in all Bristol Dynamaster potentiometers are now furnished with standardized, readily interchangeable slidewires and calibration resistors.

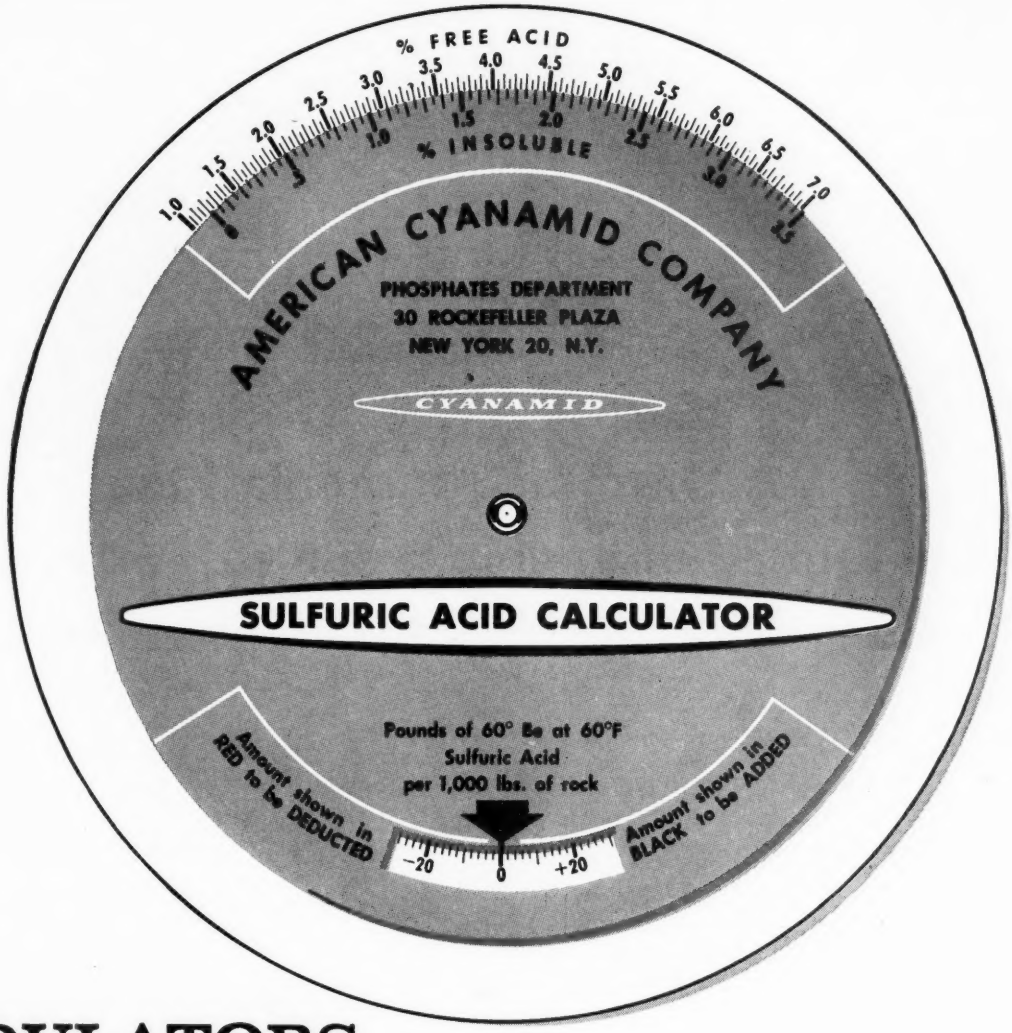
The new feature allows the range on a Dynamaster recorder to be changed quickly and accurately, if the instrument is shifted from one application to another. According to Bristol, this interchangeability of circuit components drastically reduces the time needed for modification or repair. For further information on this product,

CIRCLE 49 ON SERVICE CARD

See pages 46 and 47 for information on these Reader Service Numbers:

50—Palo Paddle **51—Weight Classifier**

52—Elevating Trucks



For ACIDULATORS

This sulfuric acid calculator is another of Cyanamid's working services to the phosphate industry. Whether your requirements are high grade phosphate for acidulation or triple superphosphate for ammoniation, Cyanamid serves you from the mine to your plant:

- **direct order service to our Brewster, Florida plant**
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- **technical service at your plant**

For free calculator, write American Cyanamid Company, Phosphates Department, 30 Rockefeller Plaza, N. Y. 20, N. Y.

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UAL-S

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Now, Du Pont offers a "Uramon" Ammonia Liquor containing ammonium sulfate. This new urea-ammonia solution, called UAL-S, combines two efficient forms of nitrogen with ammonium sulfate to provide added sulfur . . . an essential plant nutrient with recognized agronomic value.

All fertilizers benefit from nitrogen derived from UAL-S. Regular mixtures cure well, are free-flowing and resist caking. In granular mixtures, UAL-S aids in producing good yields of hard, round, firm granules that store and distribute well.

UAL-S is safe—handles at moderate pressure and there's no danger of flash fires. It's non-corrosive to fertilizer manufacturing equipment, including mild steel and aluminum. UAL-S has a low freezing point, too . . . can be stored year round in most areas.

Du Pont specialists can give you at-the-plant advice on proper use of UAL-S in your fertilizer mixtures. They stand ready to assist you in profitably formulating mixtures containing UAL-S. For further information on UAL-S, and to request the services of one of Du Pont's specialists, write the nearest office.

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POLYCHEMICALS DEPARTMENT
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Company.....

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City.....Zone....State.....

By ELMER C. PERRINE
Technical Representative
Nitrogen Division
Allied Chemical & Dye Corp.

TRANSITION from the simple processes of past days to the complexities of modern industry is often neither simple nor pleasant. The fertilizer industry has successfully absorbed its personnel into the complicated activities of granulation and general modernization.

In most cases the transition was achieved with safety and efficiency. Where the transition has been attended with hazards, the accusing fingers may be pointed at management and those who should know the hazards yet failed to carry the message through effective channels.

It is convenient, but certainly neither safe nor accurate to believe granulation is merely an extension of the making of pulverized fertilizer. Several aspects of the use of sulfuric and phosphoric acid, largely confined to granulation, demand increased alertness.

More acid and nitrogen solutions are used in a ton of granulated fertilizer than in pulverized grades because the ensuing granulation, drying and cooling will accommodate the products in large quantities and leave a fertilizer of good quality.

Ammonia and Superphosphates

The industry is now sufficiently advanced and formulation and analysis are no longer matters of chance. To be competent today an operator must know that superphosphate will readily hold large amounts of ammonia at high efficiency. But it can do this only if the ammonia is delivered to the superphosphates in direct proportions to the amount of superphosphates adjacent to the various regions of the distributor pipe.

He knows also that the ammonia should be mixing with the superphosphates as it enters the mass. Many operators are aware that ammonia gas is usually associated with high rates of ammoniation and this requires special consideration in design of equipment and in techniques of operation.

These are features developed ahead of granulation and have been adopted as originally developed, without many serious accidents.

However, only a few operators realize the sulfuric acid should be as uniformly matched against the ammonia as should be the superphosphates. The formula may be adjusted correctly as regards the maximum ammonia take-up by the superphosphates and the sulfuric acid. But, through faulty design of equipment or its maintenance, or some imbalance in the process, there may be local areas of varying sizes where excesses of acid exist.

Beware Heavy Concentrates

In some cases of fires in the mixers, certain conditions have been observed to exist. These same ones also exist in other cases where it is only "excessive fumes or the loss of nitrogen" concerning the operator.

The more conspicuous of these conditions permit heavy local concentrations of some ingredients. Fortunately, enough heat locally generated is usually dissipated throughout the mass by mixing, or by the evaporation of water, and the result may be only poor granulation or the loss of nitrogen.

The liquid phase favorable to granulation is achieved with less water if the temperature is raised. Since the heat of reaction of a pound of ammonia with sulfuric acid is about twice that of the reaction with normal superphosphate and the evaporation of water is cooling, the temptation is to react much sulfuric acid and to have a minimum of water present.

Correctly performed at fertilizer manufacturing rates this is recognized procedure and need cause little concern.

Carelessness here can be costly.

Some operators apply the sulfuric acid in one large stream through an open pipe. Others through poor inspection or maintenance find an original good acid or ammonia distributor pipe corroded or worn so badly that nearly all the material escapes through one hole.

There is a very serious corrosion problem where the acid becomes hot and diluted with water. The abrasion on submerged pipe is also severe. Close daily inspection should be instituted. Some distributor pipes last no longer than three or four days before losing their good distribution pattern.

Stainless steels have often only about double the life of extra heavy carbon steel pipe. Various coatings have been tried and some have a good promise of materially extending the life of these distributor pipes. Good distributor pipes are metering manifolds, meeting quite exacting requirements. To be effective, they should remain as originally designed.

Pressure Changes Serious

The plugging of holes has been almost as serious as corrosion and abrasion in destroying the delivery pattern. Any inspection of the numerous acid and ammonia distribution pipes scrapped show they were used a great deal after they had become potential hazards. Any change on pressure requirements of acid, water, or ammoniating media should arouse immediate suspicion.

Failure of the distribution pattern of the ammoniating solution can have the same results as an erratic distribution of the acid. Both of these and any added water should be applied uniformly throughout the mass, allowance being made for the decreasing rate of ammonia take-up as the superphosphates approach saturation.

This applies to batch as well as to continuous operations. In the usual fertilizer plant, under no circumstances should the same distributor pipe be used for acid and ammoniating solutions. Mixing these two products in a chamber as they entered the mixer has resulted in serious trouble.

The interlock system in many continuous processes automatically arrests the flow of acid and nitrogen solutions when the flow of dry materials to the mixer is interrupted. In batching mixing, the hazards are greatly reduced by withholding the potassium chloride until after the acid has been neutralized by the ammonia. Where anhydrous ammonia is employed in addition to ammoniating solutions, the risks are also greatly reduced by adding the anhydrous ammonia to act on the acid before the ammoniating solution is added.

Distribution Important

Even with the large amounts of acid often used in some granulated fertilizer, where timely delivery and good distribution of the acid and the nitrogen solution are maintained, there need be very little ammonium nitrate present until after the ammonia has neutralized all of the sulfuric acid.

The problems are largely those of the uniform distribution of both the acid and the ammoniating solutions to the mass of the fertilizer.

Reference is made to the cost of carelessness. Barring the sudden breaking or plugging of the acid, water or ammonia distributing pipes or an original design that was insufferable, some conditions associated with fires or explosions develop gradually from good or reasonably good conditions.

If the bookkeeper were looking over an operator's shoulders, observing the total cost of each ton, or even the last ton of the day, he could demand an investigation long before the operating conditions became a source of danger.

Cause Losses

The loss of plant food through poor distribution and poor mixing of ingredients may reach a unit of nitrogen per ton of fertilizer. Add to this the cost of the extra acid that usually accompanies these cases and the total cost could reach one dollar per ton of fertilizer, and is sometimes higher.

Acids and nitrogen solutions are used in great quantities per ton and in many tons of fertilizer without serious hazards.

The risks in using acids with nitrogen solutions could be materially reduced through the same means that achieve maximum granulation while retaining the maximum amount of acid at its peak of effectiveness for ammonia take-up.

Operations have been so poor in plants that personnel were driven from their operating stations by fumes. Such fumes should warn of impending trouble, without having fires in many plants from using acids with nitrogen solutions.

Continuous Mixers

There have been fires in the conventional continuous ammoniator when all equipment passed careful inspection. It was found that the mass was permitted to reach such a physical condition that it simply rocked in the mixer as one inert mass. Although all formula ingredients were present and equipment considered to be of good design—in good condition, the mixing ability of the mixer was handicapped.

Most continuous mixers, particularly those equipped with a good interlocking system and with dry ingredients reasonably well pre-mixed, can handle the problems of high analysis fertilizer manufacturing efficiently and with reasonable safety. The same is true with most rotary batch mixing installations that are well maintained and operated.

As this condition adversely effects granulation and ammonia take-up, at least in the superphosphate, every effort should be and usually is made to prevent or control it as soon as detected.

With present conditions it may not be possible or practical to completely offset by using the best present equipment and techniques, all existing factors in fires. These may even be increasing with the trends of fertilizer manufacturing because not all factors may be known.

But in no case has a switch to more efficient practices increased fires.

Several conditions are required for acids with

(Continued on page 56)

CANADIAN

Pest Control Products

SALES of pest control products in the period ending September 30, 1957 as reported by Canadian registrants were valued at $19,624,783. A breakdown of this total by group shows sales of agricultural dusts and sprays at $7,066,851; livestock treatments at $1,316,934; herbicides at $6,450,423; household and industrial insecticides at $4,096,452 and rodenticides at $344,123. Sales of products for which details are not available totalled $350,000.

Several changes in the method of reporting were made in this survey. The first change was in the reporting period—which in this report covered 12 months to September 30 insteading of ending with the calendar year. Also, details presented in this survey refer only to the sale of products registered with the Department of Agriculture as required under the terms of the Pest Control Products Act. The third change concerned the cut-off point for small firms—only those reports filed by companies which showed sales in excess of $5,000 were actually used. ▲

TABLE 1—SALES OF CANADIAN PEST CONTROL PRODUCTS

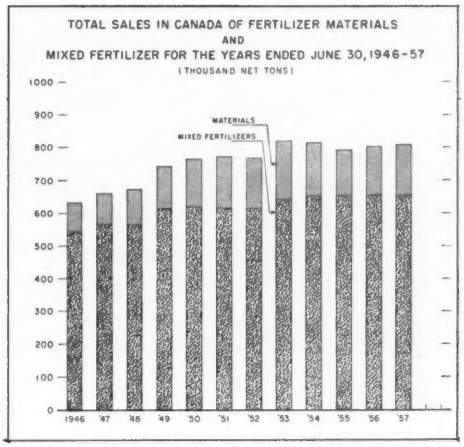
(A) Agriculture	Unit of measure	12 months ended September 30, 1957 Quantity	Value $
Adjuvants—			
Soaps, blood albumen, casein, oil spreaders, stickers, etc.	...	—	11,038
Crop and seed treatment—agricultural dusts & sprays			
Arsenicals—			
Arsenate of lead	lb.	819,473	211,604
Calcium arsenate	lb.	365,898	25,321
2% arsenic dusts (without copper)	lb.	4,794,750	207,551
Paris Green	lb.	35,589	11,902
Fluorides—			
Cryolite	lb.	15,000	1,500
Sodium fluosilicate	...	—	1,324
Botanicals—			
Rotenone dusts	lb.	533,863	131,728
Ryania dusts	lb.	147,610	36,105
Other botanicals	lb.	26,219	20,236
Synthetic organics—			
Adrin—Dusts	...	—	157,922
—Emulsions and wettable powders	...	—	369,122
B.H.C.- 6% gamma and under	lb.	59,884	5,968
—Over 6% gamma	lb.	3,294	1,093
B.H.C. (as lindane)—Emulsions	Imp. gal.	3,514	13,541
—Wettable powders	lb.	26,239	33,106
Chlordane—Dusts	lb.	152,406	28,439
—Emulsions	Imp. gal.	7 578	47,788
—Wettable powders	lb.	377	332
Dieldrin—Dusts	lb.	82,232	27,324
—Emulsions	Imp. gal.	6,282	47,627
—Wettable powders	lb.	11,513	12,043
Dinitro compounds	lb.	92,976	30,342
DDT—Dusts	lb.	990,481	77,765
—25% emulsifiable solutions	Imp. gal.	92,638	179,120
—50% wettable powders	lb.	1 609,855	388,783
Malathion—Dusts	lb.	161,207	20,449
—Emulsions	Imp. gal.	12,511	170,154
—Wettable powders	lb.	360,566	173,475
Methoxychlor	lb.	122,813	60,905
Parathion—15% wettable powder	lb.	144,613	70,750
—All other forms	...	—	23,841
T.E.P.P. and H.E.T.P. (all forms)	...	—	12,667
Toxaphene emulsions	...	—	46,285
Soil fumigants	lb.	22,191	18,805
Other synthetic organics	...	—	475,016
Copper compounds (with and without an insecticide)			
Copper sulphate	lb.	1,566,180	193,459
Copper-lime dusts	lb.	48,650	6,144
Fixed copper spray materials	lb.	285,448	116,137
Fixed copper spray materials with DDT	lb.	72,800	27,648
Fixed copper spray materials with DDT or arsenic or both	lb.	1,077,936	169,010
Copper compounds with other insecticides	lb.	31,247	4,756
Dry Bordeaux mixture	lb.	11,351	3,987
Other copper compounds	...	—	27,688
Crop and seed treatments—Other than copper fungicides—			
Dry lime-sulphur	lb.	7,706	2,967
Liquid lime-sulphur	Imp. gal.	83,986	26,765
Dusting sulphurs—without insecticide	lb.	45,795	2,919
—with insecticide	lb.	2,288	114
Wettable sulphurs—without insecticide	lb.	1,336,948	104,394
—with insecticide	lb.	107,328	43,690
Dithiocarbamates—without insecticide	lb.	2,700,140	628,294
—with insecticide	lb.	1,135,186	130,680
Mercurial fungicides (except seed treatments)	lb.	56,954	74,519
Other fungicides (not seed treatments)	lb.	1,787,862	789,095
Seed treatments—			
Organic mercurials—Liquid mixtures	...	—	254,788
—Dry mixtures	...	—	267,544
Chlorobenzene	lb.	63,715	39,128
Fungicide insecticide combination treatments			
Lindane plus fungicide	lb.	137,278	254,706
"Other" insecticides plus fungicide	lb.	198,461	318,857
Other seed treatments	lb.	99,465	103,323
Nicotine—			
Nicotine sulphate	lb.	42,051	67,562
Other nicotine preparations	lb.	10,667	7,677
Miscellaneous—			
Zinc compounds, including zinc "safeners" e.g., zinc sulphate	lb.	361,115	39,181
Mineral oils for dormant or foliage spraying	Imp. gal.	214,334	68,541
Other agricultural dusts and sprays, including hydrated lime	...	—	142,307
TOTAL AGRICULTURAL DUSTS AND SPRAYS	...	—	7,066,851
TOTAL LIVESTOCK TREATMENTS (INCLUDING POULTRY)	...	—	1,316,934
Herbicides[1]			
Arsenicals	Imp. gal.	11,286	21,625
Borates, chlorates and borate-chlorate mixtures	lb.	7,524,458	670,386
Cyanamides and cyanates	lb.	5,755	7,974
Dinitros	lb.	58,881	82,691
I.P.C.	lb.	7,331	18,301
Mineral oils	Imp. gal.	—	[2]
P.M.A.	lb. of acid	400	7,920
T.C.A.	lb. of acid	354,401	144,696
M.C.P.[1]	lb. of acid	903,711	1,157,324
2,4,5 -T formulations[1]—Ester	lb. of acid	96,414	151,535
—Amine	lb. of acid	45	218
2,4 -D formulations[1]—Ester dust	lb. of acid	112,476	156,703
—Ester liquid	lb. of acid	3,034,130	2,411,875
—Amine liquid	lb. of acid	688,216	522,641
—Other	lb. of acid	—	5,252
2,4-D, 2,4,5 -T mixtures	...	—	578,563
—2,4-D portion	lb. of acid	209,906	—
—2,4,5-T portion	lb. of acid	209,692	—
Other herbicides		—	512,719
TOTAL HERBICIDES	...	—	6,450,423
TOTAL HOUSEHOLD AND INDUSTRIAL INSECTICIDES	...	—	4,096,452
TOTAL RODENTICIDES	...	—	344,123
TOTAL PEST CONTROL PRODUCTS SPECIFIED IN DETAIL	...	—	19,274,783
TOTAL PEST CONTROL PRODUCTS NOT SPECIFIED IN DETAIL	...	—	350,000
GRAND TOTAL ALL PEST CONTROL PRODUCTS	...	—	19,624,783

[1] Firms reporting M.C.P., 2,4,5-T and 2,4-D were asked to record their sales on a basis of acid equivalent, i.e.: (a) 10,000 gallons of a 64 oz. ester were to be recorded as 40,000 lb., (b) 100,000 lb. of a 2,4-D dust (5 per cent) were to be recorded as 5,000 lb., (c) 5,000 gallons of an 80 oz. amine were to be recorded as 25,000 lb.

[2] Included with "other herbicides."

N SALES

Plant Foods



CANADIAN sales of mixed fertilizers and fertilizer materials for direct application to the soil, including exports, amounted to 1,712,310 tons in the year ended June 30, 1957, the Dominion Bureau of Statistics reports. Users in the provinces were sold 808,251 tons, including 156,497 tons of fertilizer materials and 651,754 tons of mixtures. While mixture sales were practically unchanged from the previous year, sales of materials increased 5.7 per cent from that period.

Production of fertilizer materials, excluding anhydrous ammonia, amounted to 1,174,615 tons, compared with 1,215,338 tons in the year ended June 30, 1956. The output of mixed fertilizers increased to 729,037 tons from 710,278 tons manufactured the previous year.

Imports of fertilizers, excluding anhydrous ammonia, amounted to 920,157 tons, compared with 907,599 tons during the previous fertilizer year.

Tonnage of materials exported was 854,331, including 9,448 tons of anhydrous ammonia. This represents a 2.6 per cent increase over the previous year's total of 832,471 tons which included 4,930 tons of anhydrous ammonia. Mixed fertilizer exports totaled 49,728 tons, reflecting a 29.7 per cent increase over the previous years total of 38,346 tons. ▲

Sales of Fertilizers, Except for Manufacturing Purposes
Years ended June 30, 1956 and 1957

Kind	Total sold in Canada 1956	1957
Fertilizer Materials		
Anhydrous ammonia	1,463	2,508
Nitrate of soda	747	820
Sulfate of ammonia	6,097	4,557
Cyanamide	2,626	2,150
Ammonium nitrate	24,316	26,519
Ammonium phosphate 11–48–0	45,959	49,105
16–20–0	14,714	17,823
Superphosphate—20% P_2O_5	27,672	24,376
45% P_2O_5	645	956
Natural phosphate rock	4,616	4,328
Basic slag	749	708
Bone meal, bone flour, etc.	1,805	2,052
Muriate of potash—50% K_2O	27	40
60% K_2O	5,151	4,674
Sulfate of potash	642	848
Tankage	242	343
Animal Manure	1,632	1,512
Dried blood	75	137
Sewage sludge	6,506	6,110
Other fertilizer materials	2,353	6,931
Total materials	**148,037**	**156,497**
Mixed fertilizers	**652,643**	**651,754**
TOTAL	**800,680**	**808,251**

Sales of Fertilizers, Years Ended June 30, 1956 and 1957

	Fertilizer materials			Mixed fertilizers			Total		
	1956	1957	Per cent change	1956	1957	Per cent change	1956	1957	Per cent change
					(short tons)				
Newfoundland	580	373	−35.7	4,764	4,410	− 7.4	5,344	4,783	−10.5
Prince Edward Island	386	432	+11.9	49,022	52,867	+ 7.8	49,408	53,299	+ 7.9
Nova Scotia	2,127	1,908	−10.3	24,158	24,450	+ 1.2	26,285	26,358	+ .3
New Brunswick	703	735	+ 4.6	61,604	60,280	− 2.1	62,307	61,015	− 2.1
Quebec	14,095	14,428	+ 2.4	121,412	127,546	+ 5.1	135,507	141,974	+ 4.8
Ontario	54,264	51,484	− 5.1	375,185	364,502	− 2.8	429,449	415,986	− 3.1
Manitoba	14,780	14,910	+ .9	680	754	+10.9	15,460	15,664	+ 1.3
Saskatchewan	17,900	20,708	+15.7	68	77	+13.2	17,968	20,785	+15.7
Alberta	29,157	38,165	+30.9	126	172	+36.5	29,283	38,337	+30.9
British Columbia	14,045	13,354	− 4.9	15,624	16,696	+ 6.9	29,669	30,050	+ 1.3
Canada	**148,037**	**156,497**	**+ 5.7**	**652,643**	**651,754**	**− .1**	**800,680**	**808,251**	**+ .9**
Export	832,471	854,331	+ 2.6	38,346	49,728	+29.7	870,817	904,059	+ 3.8
Total	**980,508**	**1,010,828**	**+ 3.1**	**690,989**	**701,482**	**+ 1.5**	**1,671,497**	**1,712,310**	**+ 2.4**

GYPSY MOTH

Introduction, spread and control efforts in the U. S.

Trees on right side of road have been stripped of their foliage and killed by the gypsy moth. Those on left were protected by DDT spray. USDA Photo.

By W. V. O'Dell,
Plant Pest Control Division, USDA-ARS

IN 1869 the gypsy moth (Porthetria dispar, L.) was brought to Medford, Massachusetts from Europe by a French scientist in an unsuccessful attempt to interbreed it with the silkworm. The insect escaped and after a few years became firmly established in nearby territory.

For about 30 years following its introduction, infestation by the gypsy moth was confined to eastern sections of Massachusetts. After outbreaks began to occur in these sections, infestation spread gradually to the south and west, more rapidly to the north and northeast. As a result of such spread, the generally infested area now includes most of New England and approximately the eastern third of New York State, with outlying spots of infestation extending into northern New Jersey and northeastern Pennsylvania.

Historically, greatest spread of the moth has occurred during epidemic outbreaks. In the period from 1952 to 1954, inclusive, spread to the south and west was much greater than during any previous outbreak. The present limit of such spread is known to be at the very threshold of an extremely large area in which forest stands susceptible to gypsy moth infestation are of frequent occurrence. As reported at the conclusion of an appraisal survey in 1952[1] both the abundance and degree of susceptibility of such stands increase westward from the Alleghenies and Appalachians, reaching a maximum in the unglaciated portions of the Ohio Valley, in central Tennessee and in the Ozarks. In the absence of aggressive measures to eliminate the moth from present outlying and peripheral areas of infestation, a continuing, expansive spread into these southern and mid-western areas could be expected with each succeeding outbreak.

Status of Infestation

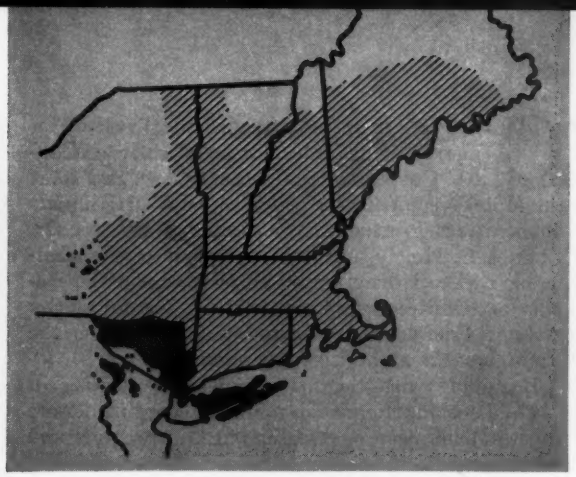
Observations that have been recorded over a period of many years in relation to moth abundance show a consistent pattern of increase and decline. Peaks in population have occurred at 7 to 8 year intervals since the early 1920's when maintenance of defoliation records was initiated. This fluctuation in moth abundance is believed to be influenced to some degree by weather cycles, with successive mild winters contributing to a high percentage of egg hatching in the spring, and severely cold winters responsible for considerable egg mortality. It is doubtful that population levels would be influenced to the same degree in areas where the winter climate is usually more moderate than in the northeastern States. This conclusion seems to be substantiated by reports that peaks in gypsy moth abundance occur every four to five years in areas of southern Europe.

Disease is an important control factor when moth abundance has reached outbreak proportions. A polyhedral virus responsible for the "wilt disease" is believed to be present in all stages of gypsy moth development. Although evidence of the disease may be noted occasionally when infestation is of moderate intensity, it appears usually with dramatic suddenness in those areas where high populations have been maintained and defoliation is reaching serious proportions. It is believed that heat, humidity, massive populations and partial starvation all may have a part in producing conditions that induce development of the disease. During such disease outbreaks many affected larvae succeed in pupating only to succumb in the pupal stage. These disease epidemics break the spiral of build-up in moth populations and, up to now at least, have prevented a succession of more than two or three years in which the insect is present in outbreak numbers in a given locality.

Parasites of the gypsy moth were introduced from Europe in substantial numbers several years ago. Some species are well established and usually can be found in any area where the gypsy moth is present. Although some degree of control is provided by parasitic activity, there has been little evidence of substantial influence in this direction. Even in Europe there are extensive areas where, in the presence of several species of native parasites, gypsy moth outbreaks occur with regularity. The parasites established in this country may exert their greatest control influence at times when moth populations are

[1] *Report of Special Gypsy Moth Survey—1952 (mimeographed) by Dowden, P. B., Hough, A. F., Littlefield, E. W., and O'Dell, W. V. Prepared by: U.S. Forest Service, Forest Insect and Disease Laboratory, 335 Prospect Street, New Haven, Connecticut.*

Traps baited with a substance that attracts male gypsy moths are used by survey crews to locate new infestations and to determine the effectiveness of aerial spraying. Photo taken by USDA.



Lined area is that generally infested by the gypsy moth—about 38 million acres in 9 states. Black area shows spot infestations and generally infested areas sprayed under Federal and State contracts in 1957—2,950 acres in 3 states. A USDA Photograph.

at low ebb, possibly prolonging the period of infestation incipiency. Such influence, however, has not been of sufficient scope to prevent periodic outbreaks of the pest. The same may be said with respect to the native and introduced predators of the gypsy moth. It is well known that small mammals and predacious insects destroy large numbers of gypsy moth larvae and pupae in forest areas having a good ecological structure. Unfortunately, environmental conditions in the dry-site forest areas most susceptible to gypsy moth infestation form an unsuitable habitat for these ground-inhabiting predators.

At the present time, gypsy moth incidence is at a low point in the curve of population density. Seasonal observations that have been made since the 1957 hatching period indicate the prevalence of this low-ebb condition throughout a high percentage of the generally infested area. The previously cited natural control factors undoubtedly have contributed to recent declines in moth abundance. However, if previous behavior patterns can be accepted as reliable criteria, it may be expected that populations soon will increase and that a general build-up of infestation will occur during the next three or four years.

Past Accomplishments

From the beginning of Federal participation in gypsy moth suppression work in 1906 the program objective has been to prevent spread of the moth to uninfested States and regions. Federal and State quarantines in force since 1912 have been major factors in preventing a much wider distribution of the pest. Regulatory action has been continuously supported by control operations, although the latter have not been of sufficient magnitude to inhibit the natural spread of infestation during epidemic outbreaks. Consequently, the area containing general infestation has been progressively enlarged to its present size of approximately 40 million acres.

Isolated infestations have been found occasionally in outlying areas beyond the western limits of general infestation. These have been exterminated through vigorous, cooperative action which could be applied in some instances while infestation was still in an incipient stage of development. An outstanding example of successful extermination work is that completed in New Jersey in 1935. When found in 1920, this infestation of foreign origin covered an area of 1,450 square miles. Extermination was accomplished in a period of 15 years through the application of intensive regulatory and control practices, which included the spraying of all infested growth with lead arsenate. Another outlying infestation of similar proportions was found in the anthracite coal region of Pennsylvania in 1932. Extermination efforts in this rough, mountainous area met with little success until DDT became available and experiments showed the feasibility of applying sprays of this insecticide by aircraft. Tests of the insecticide against the gypsy moth in a heavily infested woods area showed that complete elimination of infestation was obtained when spray was applied at the rate of one pound of DDT in one gallon of spray per acre. After exhaustive research had indicated that one pound per acre of DDT could be safely used for spraying infested areas, it was adopted as a standard dosage for eradication treatments. Using this dosage in aircraft spray operations, the former Pennsylvania infestation was eliminated in four seasons of spray work. No recurrence of infestation has been found in the treated area since spraying was completed.

More recently in the spring of 1954, an outlying gypsy moth infestation was discovered at Lansing, Michigan. The central area of infestation was eliminated by aerial spraying that same year. Infestation in fringe areas has been treated in subsequent operations. Recent surveys indicate that eradication of this infestation is virtually completed. The evident success in these and other instances where outlying areas of gypsy moth infestation have been treated for eradication, has led to the conclusion that similar results can be obtained in areas of greater magnitude throughout the generally infested region.

The Current Program

The extensive spread of infestation that was found following the outbreaks of 1953 and 1954 showed

(Continued on page 44)

Northeastern Weed Control Conference HIGHLIGHTS

OVER 500 members attended the Twelfth Annual Meeting of the Northeastern Weed Control Conference held January 8, 9, and 10 at the Hotel New Yorker, New York City. Highlights of the meeting included a welcoming address by Dr. Charles L. Hovey, outgoing president of the Conference. Dr. Hovey placed emphasis upon the Report of the Research Co-ordinating Committee by giving a brief summary of its development over the past few years and outlining present policy.

Beginning with the first Conference meeting in 1947 as nothing more than minutes recording a state by state summary of research work in progress and recommendations currently being made, the Research Co-ordinating Committee Report has, through the years, become a formal compilation of experimental results showing 1) Herbicides Satisfactory in Research Trials, 2) Herbicides Promising in Limited Trials, and 3) Problems Needing More Work.

Dr. Hovey went on to say that the Report has developed into a useful tool which is being relied upon by state, Federal, and commercial company employees. He re-emphasized the importance of all Conference members giving attention to the Report and insuring that it "continues to be a factual report of the Conference and does not become a collection of opinions from a few people."

Statutory Limitations

Of exceptional interest to herbicide manufacturers all through the United States was the report by Jack Dreessen, Herbicide Specialist, National Agricultural Chemicals Association. It was entitled "Statutory Limitations on the Use of Herbicides."

Mr. Dreessen pointed out that all herbicides must be registered with the USDA and over 35 states require similar registration. In addition to these laws regulating herbicide sales, he said, 8 states have laws controlling herbicides used and application methods, and 25 states regulate custom application practices.

To help clarify the 1954 Miller Pesticide Residue Amendment, Mr. Dreessen explained that it does not change any basic requirements of the 1938 Federal Food, Drug and Cosmetic Act. Rather, he said, it brings the full implications of the act to the attention of herbicide manufacturers and research workers in weed control. He explained that, under the "Miller Bill," there are specific procedures for obtaining tolerances or exemptions from tolerances for those uses of pesticides that leave a residue.

First, he said, results of toxicity studies must be submitted to the Food and Drug Administration. Second, any petition for a tolerance must include these toxicity studies, plus studies showing residues likely to remain on the crop at harvest. If there is no residue, toxicity information is not required by the FDA. However, he stated that toxicity information normally required to satisfy registration requirements (toxicity to the applicator and the farmer's crops and animals) must still be submitted to USDA.

(Ed. note: For more complete description of the "Miller Bill" see Dr. H. L. Haller's talk in this issue.)

With regard to the "current status" of herbicide registration, Mr. Dreessen said that a "status of confusion" exists which results from a "lack of good communications between registration and control officials, on the one hand, and the researcher, on the other hand."

Mr. Dreessen emphasized that only someone engaged in herbicide registration could authoritatively and accurately report a current status. He said the "Summary of Certain Pesticide Chemical Uses," a May, 1957 publication of the Pesticide Regulation Section, USDA, lists those herbicides accepted for registration which meet the requirements of the Miller Amendment. Periodically issued sheets keep it up-to-date. Mr. Dreessen recommended that persons responsible for recommendations study it carefully to keep abreast of all recently listed tolerances and exemptions.

Because certain uses are not listed does not necessarily mean they are illegal or have been cancelled, Mr. Dreessen emphasized. "It is important to keep in mind that an herbicide can be legally used, even if it does not have a published tolerance, when its use leaves no residue," he said, and pointed out that most uses of herbicides have been cleared on a no residue basis.

Promising New Chemicals

Dr. E. M. Rahn, Chairman of the Research Coordinating Committee, reported on "Promising New Chemicals for Weed Control." Following is a summary of his report.

EPTC, recently introduced by the Stauffer Chemical Company, appeared promising in limited trials as follows: for preventing germination of tubers of nutgrass; for pre-emergence weed control in corn, soybeans, beets; for post-planting applications made pre-emergence to weeds in alfalfa and red clover for control of chick-weed, on potatoes at lay-by, on tomatoes and strawberries.

Simazin, introduced by the Giegy Company, has been generally effective in pre-emergence applications to corn and sweet corn at rates of 1–4 pounds per acre; for soil sterilization at rates of 10–20 pounds

Dr. L. L. Daniels, left, awards committee chairman, with County Agent John T. Smith of York County, Pennsylvania, who received award for his outstanding weed control program.

per acre; for eradication of horse nettle and quackgrass.

The phenoxybutyrics looked promising for control of summer annual broadleaf weeds in permanent pasture, in seedling and established alfalfa and red clover, in semi-permanent pastures of ladino clover and ladino-grass mixtures, and in small grains underseeded to legumes. These herbicides were less active than the phenoxy acetics and therefore had to be applied when weeds were very small, and at higher rates. They were less injurious to legumes than the phenoxy acetics.

The phenoxyproprionics looked promising for killing woody plants, especially oaks, maples, and black locust; brambles, and woody plants in pastures; wild onion and garlic, chickweed in turf; poison ivy, and aquatic weeds.

The polychlorobenzoic acids looked promising for long-lasting weed control in corn and sweet corn, for eradication of quackgrass, and wild onions and garlic. 2,4-D acetamide also gave long-lasting weed control in corn and sweet corn in either pre-, at-, or post-emergence applications.

Neburon, a recent introduction of the DuPont Company, looked promising for weed control around ornamental plants and lines in the nursery, in strawberries, and for control of chickweed in lawns and in alfalfa and red clover.

The isobutyrates were effective for control of crabgrass in lawns at some locations. CDAA (Randox) looked promising for control of annual grasses in beans, corn and onions. CDEC (Vegadex) was generally effective for control of weeds, especially grasses, in a number of vegetable crops, especially spinach, cabbage, cauliflower, broccoli, beets and celery.

Amino triazole gave good control of poison ivy, and was safe to use even around sensitive trees. This chemical has been very effective for killing hard-to-kill perennial weeds, such as horse nettle, milkweed, Canada thistle and chrysanthemum weed.

Vapam and Mylone were effective as soil drenches applied 2 or 3 weeks before planting vegetable and flower seeds, lawns, seedlings and liners of ornamental plants, and tobacco.

Various combinations of herbicides were found more effective than either herbicide alone. Particularly effective combinations were: Randox and 2,4-D, dalapon and amino triazole, dalapon and DNBP, and CDEC and CIPC.

Granular herbicides were found to be fully as effective as the same materials applied as sprays in pre-emergence applications.

Achievement Awards

John T. Smith, County Agent, York County, Pa., was awarded a Certificate of Merit by the Conference for his outstanding weed control program. Mr. Smith reported that the greatest problem facing York County farmers is chickweed. In combating this problem, Mr. Smith has so effectively promoted a spraying program that 25 to 33-⅓ per cent of his farmers have adopted it. Cornfield weed control is another problem he emphasizes. Mr. Smith's experience has shown that pre-emergence application has proved more effective than post-emergence. Farm-born and reared and a graduate in Agricultural Education of The Pennsylvania State University, Mr. Smith devotes six, 12 hour days a week to his work.

This dedicated agricultural worker justly deserves the acclaim of Northeastern herbicide researchers.

Other Certificates of Merit were awarded to Dr. C. M. Switzer, Assistant Professor of Botany, Ontario Agricultural College, Guelph, Ontario, for outstanding contributions to research in weed control as shown by his meeting presentation of "Effects of 2,4-D on Turnips"; Professor E. Campagna, Head of the Department of Botany and Weed Control, Faculte di Agriculture, Ste-Anne-de-la-Pocatiere, Quebec, Canada, for outstanding work in ragweed control; Alfred H. Fletcher, Director, Division of Environment Sanitation, New Jersey Department of Health, for the development of ragweed control programs; Louis V. Fucci, Executive Director, Hayfever Prevention Society, Inc., New York City, for his 25 years of support and encouragement of the control and eradication of ragweed plants; Mrs. Edith Bowman, Vice-President, Air Pollution Control League of Greater Cincinnati, Ohio, for advancing improvements in weed control ordinances to benefit hayfever sufferers and for obtaining from governors throughout the country proclamations that June be "Ragweed Control Month."

New Officers Elected

An announcement of new officers elected for 1958-59 showed the following balloting results: President, Dr. S. N. Fertig, Extension Agronomist, Cornell University; Vice-President, Dr. L. Gordon Utter, Manager, Technical Services, Agricultural Chemicals, Diamond Alkali Company; Secretary-Treasurer, Dr. D. A. Schallock, Extension Specialist, Farm Crops Department, Rutgers University. ▲

The impact of Public Law 518 on herbicides

"The Miller Bill," passed on July 22, 1954, as the Miller Pesticide Residue Amendment to the Federal Food, Drug, and Cosmetic Act, is formally known as Public Law 518 of the 83rd Congress. Here is a discussion of it, with references to its effect on herbicide researchers and manufacturers.

There is ample evidence that research workers make every effort to find the minimum amount of a pesticide that is necessary to control a pest. This effort is made in the interest of both health and economics. Although the evidence indicates that *properly used* pesticides are not a health hazard, research workers in pest control must continue to be on the alert to insure maximum safety.

The objective of P. L. 518 is to protect the *public* from injury through consumption of excessive and harmful residues of pesticide chemicals on food in its raw or natural state, including all fruits, vegetables, nuts, eggs, raw milk, forage, and meats. The new law recognizes that sprays and dusts are necessary to assure a continuing supply of high quality foods, and it is designed to permit their use without hazard to the consumer. It permits a flexible type of procedure and, basically, replaces the old procedure, which required a formal public hearing before a tolerance could be established.

To obtain a tolerance, under P. L. 518, the manufacturer or interested person submits the following information to the Food and Drug Administration and the U. S. Department of Agriculture:

1. Data showing the effectiveness of the chemical to control the pest for which it is intended and the commodity to be treated.
2. Amount of the residue which will remain in or on the crop when the chemical is used in accordance with label directions, including a description of the analytical method used.
3. Full report as to the safety of the pesticide chemical.
4. Practicable methods for removing the residue which exceeds any proposed tolerance.

The responsibility of USDA under the new law is in connection with the registration under the Federal Insecticide, Fungicide, and Rodenticide Act of only those pesticides that may leave residues on or in raw agricultural commodities. The Department is required to send a certification to the FDA as to whether the product under consideration is useful for the purpose intended. An opinion is also required as to whether the tolerance or exemption proposed reasonably reflects the amount of residue likely to result when the product is used as intended. Following certification by USDA, the FDA determines what residue of the pesticide will be without hazard to man and establishes the tolerance.

Tolerance Levels

The tolerance for any pesticide is not always set at the highest level consistent with safe consumption of a treated crop but is set at the lowest possible level consistent with safety and the effective use of the pesticide concerned. Thus, it is possible for a relatively safe pesticide to have a lower tolerance than a more toxic one. This is in accord with the fundamental philosophy that food shall not carry any more than is absolutely necessary of a substance that is not normally present. There has been some tendency to relate the tolerance established to acute or chronic toxicity of a pesticide. For example, one chemical may be reputed to be ten times as toxic to warm blooded animals as another. If a tolerance of 10 ppm is established for the less toxic chemical, it does not follow that the more toxic chemical will be granted a tolerance of 1 ppm.

When registration under the Federal Insecticide, Fungicide, and Rodenticide Act is requested for the use of a pesticide for which no residue has been found, all data, including analyses of untreated prod-

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Excerpts from a talk entitled "The Impact of Public Law 518 on Herbicide Research and Recommendations" by Dr. H. L. Haller, Assistant to Administrator, Production Research, Agricultural Research Service, USDA, at the Weed Society of America Meeting, Memphis, Tennessee, January 13–15.

ucts and the sensitivity of the analytical method used, will be considered. In some cases the data will be discussed informally with representatives of the FDA to determine whether they can be accepted as adequate proof of absence of residue. If it is determined that no residue will occur in the treated products it will not be necessary to obtain a tolerance or exemption from tolerance.

Under P. L. 518, all pesticides fall into one of four classes:

1) Safe chemicals. These may be used without a tolerance or exemption. Lime, sulfur, and various combinations of the two are in this category. None of the herbicides are so classified.

2) Chemicals exempt from the requirement of a tolerance. Such chemicals have been exempted because they are low in toxicity and their use in accordance with good agricultural practice on growing crops will not result in harmful residues. Certain copper compounds, petroleum oils used as dormant sprays or herbicides, and several plant insecticides and synergists fall into this class. These pesticides are not automatically exempted from the requirement of a tolerance when applied to a crop at the time of or after harvest. As mentioned above, only petroleum oil herbicides are exempt from a tolerance.

3) Chemicals with a zero tolerance or the equivalent. These are chemicals which are so toxic that no residue should remain on food as it is marketed or they are chemicals that have not been studied enough to show whether a higher tolerance is warranted. Certain mercury compounds and substitutes of dinitrophenols which are used as herbicides are examples of chemicals having a zero tolerance because they are too toxic.

Official tolerance for them has not been established under P. L. 518. However, following the 1950 hearing on pesticide residues in food the Food and Drug Administration directed that these chemicals should be used only under conditions that leave no residue on fruits and vegetables as prepared for market.

There has been considerable discussion of what is meant by "the practical equivalent of zero." This question arises in connection with the presence of foodstuffs of a chemical in such small quantities as to represent a toxicologically trivial amount. As an example—a certain operation may introduce mercury into an edible oil at a level of three parts per billion yet the tolerance for mercury in foodstuffs is zero. Two separate sub-committees of the food protection committee, National Academy of Sciences considered the problem. One of the committees concluded that there is no scientific basis for designating a finite quantity as zero but added that "it might be expedient legally to do so." The other sub-committee unanimously agreed that a basis does exist for considering trivial quantities of chemicals in food as insignificant or inconsequential and that there is both scientific and practical justification for this. It is clear from these two reports that the problem is an exceedingly difficult one.

4) Chemicals for which tolerances have been granted. Tolerances or exemptions have been granted for approximately 90 pesticide chemicals involving a total of more than 1,600 individual uses. These include nine herbicides involving about twenty different crops. Some are based on the 1950 spray residue hearing and some result from the new procedure.

It should be noted that a tolerance is established for the use of a chemical on a specific crop and does not apply to all other crops. For example, a tolerance of 2 ppm has been established for SES on asparagus and strawberries but when used on peanuts and potatoes the tolerance is 6 ppm. In the case of these crops separate residue data had to be submitted for each crop. To reduce the amount of research the FDA has made a tentative grouping of some crops. For example, when data has been submitted to justify establishing a tolerance for a given chemical on alfalfa, less complete information will be needed to extend that tolerance to clovers, cowpea hay, lespedeza, lupines, peanut hay, pea-vine hay, soybean hay and vetch. Up to the present, however, data on one member of a category has not permitted the establishment of tolerances on all crops in the list.

Last May the Pesticide Regulation Section of USDA issued a "Summary of Certain Pesticide Chemical Uses." The summary lists the tolerances and exemptions of those pesticide chemicals that have been registered under the Federal Insecticide Act, come under the jurisdiction of P. L. 518, and meet the requirements of that law when the application pattern and limitation shown for each chemical is followed. Registrants are expected to use it, and if the claims made on the label of their product are not covered by a tolerance or exemption they will be expected to obtain the necessary data or submit revised labels for registration. Recommendations for the use of herbicides in fruits, vegetables and forage should not be made where it is known that a residue occurs and no tolerance or exemption has been established. Recommendation should also be withheld if it is known that the residue will exceed the tolerance established for the herbicide and commodity involved unless a modified recommendation can be made to avoid exceeding the tolerance. The list is being kept current by amendment sheets which are distributed periodically.

Plant growth regulators, defoliants, desiccants and sprout inhibitors are not regulated under the Federal Insecticide, Fungicide and Rodenticide Act and therefore P. L. 518 does not apply to them. However, if their use leaves a residue on food they are subject to the Federal Food, Drug, and Cosmetic Act and therefore a tolerance or exemption is required. To obtain a tolerance, necessity for the use must be established to the satisfaction of the FDA. P. L. 518, on the other hand, requires only that a pesticide chemical is useful for a specific purpose.

Current Herbicide Problems

What are some of the problems that still confront herbicide workers? One of the most important is the need of residue data for those chemicals which

(Continued on page 55)

GYPSY MOTH

(Continued from page 39)

that program operations at that time were inadequate to prevent continued spread of the gypsy moth. The potentials for more rapid spread and build-up of infestation were greater than before because of the expanded periphery and an increased abundance of susceptible growth in the new fringe areas of infestation. Concern about the western and southern spread of the moth now became evident on a nationwide scale. The problem was considered by the National Association of Commissioners and Secretaries of Agriculture, the National and Regional Plant Boards and a special committee of the Council of State Governments. The concern of these groups was reflected in the calling of a conference on March 6, 1956 when representatives from 15 States met in Washington with Department of Agriculture officials to decide on the future of the gypsy moth program. The question arose, "Should the quarantine be dropped and the moth allowed to spread, with areas to be treated only as necessary to prevent defoliation?" In considering this question there were those who pointed to the eradication work in New Jersey, Michigan and Pennsylvania and reasoned that if relatively small areas of infestation could be eradicated, the entire infestation in the northeastern States could likewise be eliminated. Representatives of the infested States recognized the difficulties inherent with an eradication program and some hesitated about recommending an all-out eradication effort. There was general agreement, however, that the quarantine should be continued and the conference concluded that an effort should be made to effect eradication of the gypsy moth from the United States. Consequently, representation was made to Congress to finance such a program that would be cooperative with the States. The Congress provided funds to initiate eradication work in outlying areas in 1956 and agreed to a continuing program, based on availability of both Federal and State funds, to provide for the eventual eradication of the gypsy moth.

The first phase of the eradication program was initiated in 1956 when more than 686,000 acres were aerially sprayed in Michigan, New York, New Jersey and Pennsylvania. This cooperative eradication work was supplemented by the additional treatment of 244,000 acres in New York and New England to suppress the moth at various outbreak centers. This was followed in 1957 by the first large-scale eradication effort in which more than 3 million acres were aerially sprayed in New York, New Jersey and Pennsylvania, and nearly 19,000 acres were sprayed in mopping up the last known vestiges of the Michigan infestation. More than 400,000 additional acres were treated in 1957 for suppression of infestation at various sites in New England and eastern New York.

The large-scale operations in 1957 were conducted in peripheral areas of infestation into which the moth had spread in recent years. Due to the newness of infestation to these areas, the public in general was unaware of the potential threat to gypsy moth host plants because no evidence of damage had yet developed. This created certain problems in relation to public acceptance of the program by reason of the fact that spray areas included heavily populated municipal and suburban centers where application of insecticides from the air was an entirely new experience. Aside from these problems in the field of public relations, the principal difficulties encountered were in connection with the timing of spray applications in the vicinity of growing crops. Because of unforeseen delays in spray applications at the beginning of the program, there were instances of damage to fruit and vegetable crops from late-season application of the oil-base spray solution. The experience gained from this first season of large-scale operations has brought to light the need for certain modifications in spray schedules and formulations. Through the cooperative efforts of organizations participating in the program, these problems are being studied with the view of making whatever modifications that may be necessary before the beginning of another spray season.

With the current intensity of infestation at low ebb, there is opportunity to make substantial progress in the eradication effort. The absence of outbreak conditions over much of the infested region minimizes the danger of natural spread of the insect. This condition also affords reasonable assurance that areas treated for eradication will not become seriously reinfested as long as moth populations remain at a low level in adjacent territory.

Opposition to the eradication effort has been voiced in some quarters and the suggestion made that adequate control of the pest can be obtained through the media of disease, parasites and predators, including birds. This viewpoint ignores the succession of outbreaks that has occurred with phenomenal regularity and the enlarged area of infestation that becomes involved with the occurrence of each new outbreak. It disregards also the fact that feeding by birds on the very hairy gypsy moth larvae is so limited as to be insignificant as a control factor. Experience with this pest indicates clearly that in the absence of applied controls there will be continuing periodic outbreaks and consequent spread, eventually extending throughout the natural range of gypsy moth host plants.

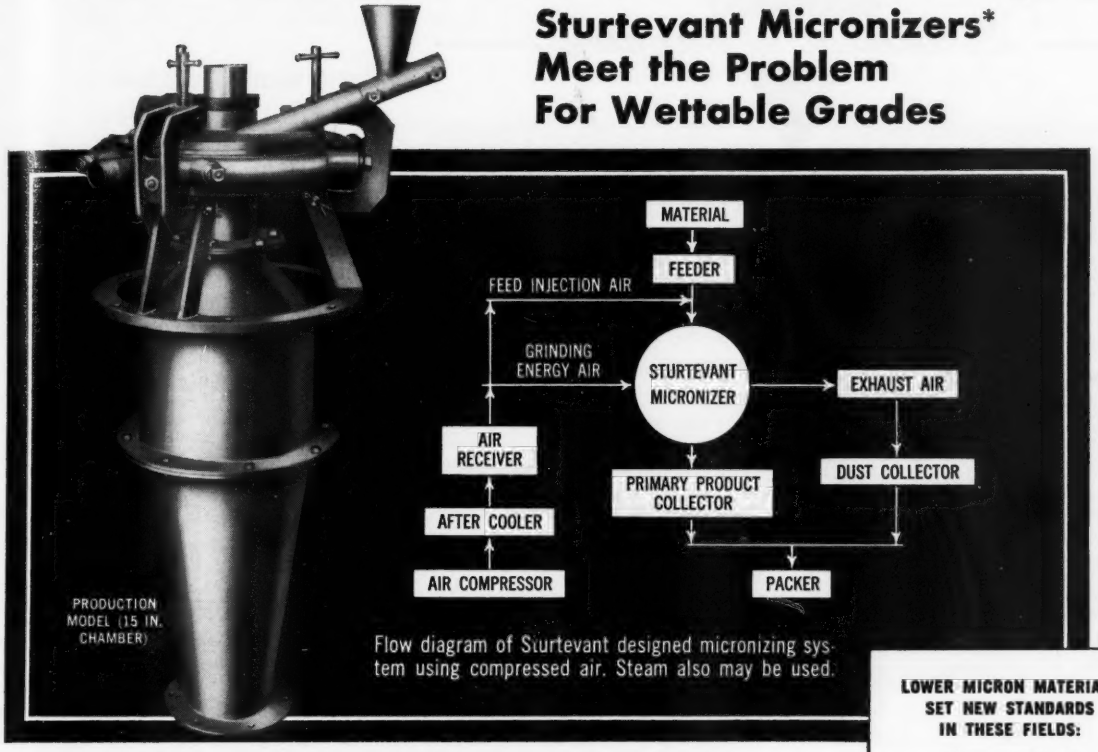
Eradication work projected in 1956 and 1957 appears to have been accomplished effectively. Moth traps were placed in eradication areas of the northeastern States and in Michigan to determine the effectiveness of the program. No moths were recovered in the sprayed areas of Michigan. Intensive trapping in the 1957 eradication areas of New York, Pennsylvania and New Jersey resulted in recovery of moths in only a few scattered areas totaling less than 20 thousand acres. The mop-up spraying that may be required at these sites represents about 1 per cent of the sprayed area checked with traps this year.

Trapping conducted in 1957 beyond the outer limits of sprayed areas, resulted in recovery of single moths at three separate sites in New Jersey. Also

(Concluded on page 53)

Insecticides to I.C.A.-W.H.O. Specs.

Sturtevant Micronizers* Meet the Problem For Wettable Grades



Flow diagram of Sturtevant designed micronizing system using compressed air. Steam also may be used.

LOWER MICRON MATERIALS SET NEW STANDARDS IN THESE FIELDS:

Pharmaceuticals
Pigments (natural and synthetic)
Copper compounds
Filler materials
Aluminum compounds
Resins
Flour
Sugar
Calcium compounds
Heat sensitive materials
Magnesium compounds
Zinc compounds
Waxes and fatty acids
Fungicides and insecticides

Particles Grind Each Other, Classifying is Simultaneous; No Attritional Heat

One operation. Sturtevant Micronizers grind and classify in a single fluid-jet chamber — provide fines in range from ½ to 44 microns to meet today's increased product fineness requirements. Because of impact action and cool atmosphere, even heat-sensitive materials can be handled.

No moving parts. Particles in high speed rotation, propelled by compressed air or steam entering shallow grinding chamber at angles to periphery grind each other by violent impact. Design provides for instant accessibility, easy cleaning.

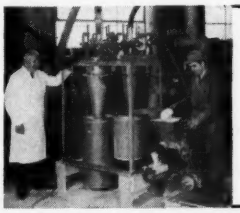
Simultaneous classification. Centrifugal force keeps over-size materials in the grinding zone, cyclone action in central section of chamber classifies and collects fines for bagging. Rate of feed and pressure control particle size of fines.

Can combine other processes. Sturtevant Micronizers can be adapted for coating one material with another and for effecting chemical reactions and changes in physical characteristics, while in process of reducing solids to micron size.

Eight models available. Grinding chambers are in eight sizes, ranging from 2 in. diameter laboratory model (½ to 1 lb. per hr. capacity) to large 36 in. diameter production model (500 to 4000 lbs. per hr. capacity). Send today for fully descriptive literature.

Fluid-Jet Systems For Special Needs

A 30 in. Sturtevant Micronizer is reducing titanium dioxide to particle size under 1 micron at a feed rate of 2250 lbs. per hr. For another firm, a 24 in. model grinds 50% DDT to 3.5 average microns at a solid feed rate of 1200 to 1400 lbs. per hr. A pharmaceutical house is using an 8 in. model to produce procaine-penicillin fines in the 5 to 20 micron range. Iron oxide pigment is being reduced by a 30 in. Micronizer to 2 to 3 average microns at rates of 1000 lbs. per hr. Sturtevant Engineers will help you plan a Fluid-Jet system for your ultra-fine grinding and classifying requirements. *Write today.*



CAN TEST OR CONTRACT MICRONIZING HELP YOU?

Laboratory test-micronizing of your own material, or production micronizing on contract basis, are part of Sturtevant service. See for yourself the improvement ultra-fine grinding can contribute to your product. Or, if you have limited requirements for ultra-fine grinding, Sturtevant's contract micronizing service may be the economical answer. Write for full details.

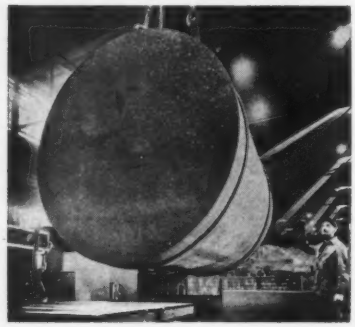
* REGISTERED TRADEMARK OF STURTEVANT MILL CO.

STURTEVANT MILL COMPANY Clayton St., Boston 22, Mass.

CRUSHERS • GRINDERS • SEPARATORS • BLENDERS • CONVEYORS • ELEVATORS

HUGE ELECTRODE DEVELOPED BY NATIONAL CARBON CO.

National Carbon Co., division of Union Carbide Corp., has developed the world's biggest carbon electrode. The 10-ton



electrode measures more than 5 feet in diameter and was developed in anticipation of the future needs for larger electrodes for mammoth submerged arch arc furnaces now being designed. On the drawing boards are electric furnaces that will use as much as 50,000 kilovolt-amperes of power in producing phosphorous, calcium carbide, and ferro alloys for the chemical and steel industries. Furnaces of this type use three 110-inch long carbon electrodes to conduct the high electric currents.

STIRRING PADDLE PROMOTES HIGH VELOCITY OF FLOW

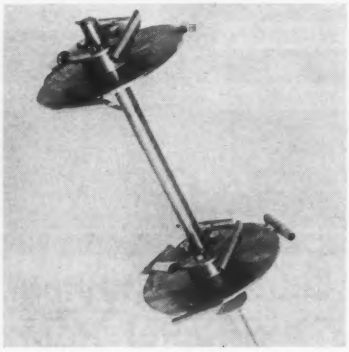
The "Impelator," a new type stirring paddle has been introduced by Palo Laboratory Supplies. The company states that the stirring device not only sets in motion the media to be mixed, but combines centrifugal force, suction and shearing action and counter whirl. Palo reports that this combination, while creating an efficient intense mixing zone, also promotes a very high velocity of flow through the entire vessel, ensuring maximum dispersion with minimum particle size.

The device performs the following operations: routine laboratory stirring, the preparation of emulsions. the mixing of liquids with solids, the manufacture of solutions, the mixing of liquids varying viscosities.

For more details,

CIRCLE 50 ON SERVICE CARD

Palo Laboratory Supplies' "Impelator"



NEW CASE UNIT LOADER

J. L. Case Co. has introduced a new 4-wheel drive, rear-wheel-steer tractor-loader which it says incorporates revolutionary advancements in operating and safety features.

Designated as the W-9 Terra-load'r, the unit was engineered, built and powered by Case. It is the fore-runner of a complete new series of heavy-duty rubber tired industrial loaders which the company plans to introduce in the near future.

Three interchangeable buckets are available for the W-9—1⅜ cu. yd. (heaped) heavy-duty digging bucket; 1-¾ cu. yd. standard material bucket, and 2-¾ cu. yd. light material bucket.

Outstanding new design feature, according to Case, is the use of short, rigid lift arms, pivoted forward of the operator's position. This, together with a low center of gravity and extra-wide wheel tread (74 ¾") is said to give the W-9 exceptional side-stability, as well as longer forward-reach in all positions.

BASIC WEIGHT CLASSIFIER

The Exact Weight Scale Co. has announced a new Basic Weight Classifier for classifying, and for process control of products and packages by weight. The classifier may also be used for production line inspection of metal assemblies for missing parts and open or closed packages for correct contents.

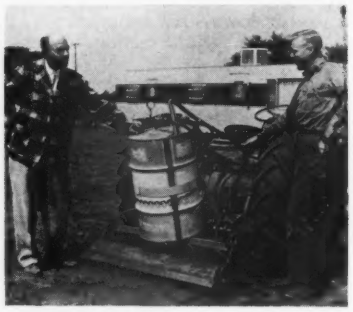
The Company's Shadograph Scale used in the Basic Weight Classifier is offered in 34 different models. Capacities range from 2000 milligrams up to 100 pounds.

For more details,

CIRCLE 51 ON SERVICE CARD

BLADE INJECTOR FOR LIQUID FUMIGANTS

A blade injector, an attachment hooked behind a wheel tractor for the purpose of injecting liquid fumigants into the soil, has been developed by Rear's Farm Supply in cooperation with the Stauffer Chemical Co. The blade was designed primarily to apply Stauffer's Vapam, fumigant which can be applied by sprinkling and other methods, but has best results when injected. Rear's will build nine injectors for Stauffer distributors located at key points in the Pacific Northwest. Thus, farmers in any part of this region can have Vopam applied by this method if conditions warrant.

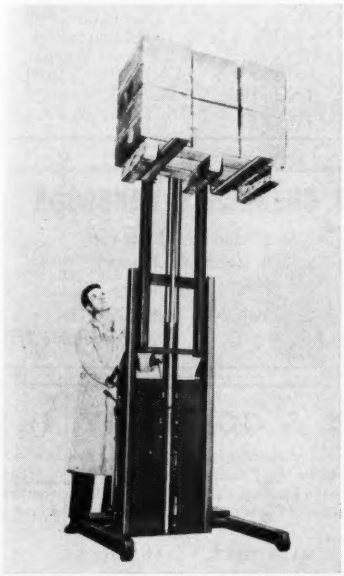


Clay Shelton, left, Stauffer Co., field representative, inspects blade injector with James Rear of Rear's Farm Supply, manufacturers of the equipment designed especially for the application of Vapam.

ELEVATING TRUCKS NOW HAVE TELESCOPING MASTS

American Pulley Co. has announced that four new telescoping mast trucks have been added to its Safeway Portable Elevating Truck Line.

These trucks clear standard doorways yet lift 1000-lb. loads as high as 10-feet, 10-inches. Power for lifting is supplied by means of a 12-volt battery-operted hydraulic system.



The standard model is supplied with 26" adjustable forks. Other fork lengths, drum-stacking devices, crane booms, rams or platforms are also available. They may be quickly changed in the field. For more data,

CIRCLE 52 ON SERVICE CARD

NEW TEMPERATURE CONTROL

A new mercury-actuated indicating temperature control designed for the chemical and process industries was introduced early this month by the Partlow Corp. Designed by Raymond Loewy Associates, the control features a dual mounting design.

Said to be accurate to within one-half per cent of scale range, the controller will sense, indicate and control processes within the ranges of -30 to 1100 degrees F. Available in ten different scale ranges, its scope of application includes all types of process operations, ovens, cooking kettles, and packaging lines where temperature tolerances are close.

The instrument has a feature called "Accu-vision" which is said to guarantee accuracy in setting and reading the instrument. This includes an increased dial area; a special magnifying setting pointer equipped with two hairlines for parallax sighting, and an optically-designed combination of dial colors. It also features a mounting arrangement which permits the case to be either flush or wall mounted without any additional mounting brackets or hardware.

TOTE SYSTEM MARKETS STAINLESS STEEL BIN

Tote System, Inc., has announced that stainless steel bins will be added to its line of standard Tote equipment. The new stainless steel containers can be hermetically-sealed and are adaptable as shipping and storage containers, and discharge hoppers.

USDA REPORTS ON ITS NEW RESEARCH GROUPS

The U.S. Dept. of Agriculture has issued a report on its progress in setting up special pioneering basic research groups. These new units, organized around outstanding scientists, are being established in various divisions of USDA's Agricultural Research Service. Plans for them began to take shape as early as last April, following a realignment of functions within the service.

So far, two are in full operation at the Agricultural Research Center in Beltsville, Md. They are the Pioneering Laboratory for Plant Physiology in the Crops Research Div., and the Pioneering Laboratory for Mineral Nutrition, in the Soil and Water Conservation Research Div.

Charters have been approved for three additional laboratories, also to be located at Beltsville. They are the Pioneering Laboratories for Insect Pathology and Insect Physiology, in the Entomology Research Div. and the Pioneering Laboratory for Blood Antigen Research, in the Animal Husbandry Research Div. Pioneering research groups in a number of other Agricultural Research Service divisions are being planned.

CHEMICALS

INSECTICIDE REGISTERED

Chemagro Corporation, New York, N. Y., has announed the registration of "Guthion" 12½ per cent wettable powder by the U. S. Department of Agriculture for use on deciduous fruits.

Guthion is being recommended for control of 11 of the most important insect pests on apples and crab apples. These are: Apple Aphid, Apple Maggot, Codling Moth, European Red Mite, Two-Spotted Mite, Plum Curculio, Red-Banded Leaf Roller, Fruit Tree Leaf Roller, Tarnished Plant Bug, Stink Bug, European Apple Sawfly.

Chemagro adds that Guthion has proven to be very effective against the following insects which attack peaches, nectarines, apricots and quinces: Oriental Fruit Moth, Plum Curculio, European Red Mite, Two-Spotted Mite, Tarnished Plant Bug, Stink Bug.

CARBIDE ANNOUNCES NEW CRAG MYLONE FORMULATION

Union Carbide Chemicals Co., Division of Union Carbide Corporation, has developed a new way to formulate Mylone soil fumigant, and will institute a different plan for marketing the product, according to Dr. R. H. Wellman, Manager of the Crag Agricultural Chemicals Department.

The new formulation—to be designated Crag Mylone 50D Soil Fumigant—is a free-flowing mixture containing dry wheat bran. According to Union Carbide, it can be quickly and easily applied with a fertilizer spreader, and effective control of soil fungi, nematodes, insects, and weed seeds can be obtained without the use of a plastic cover.

The 50D formulation is being recommended to the company's formulator customers. Carbide will market only Mylone fumigant formulation grade to these pesticide manufacturers, who will then formulate and assume full sales responsibility for their own brand name products. Formerly, Carbide supplied a Mylone wettable powder (Crag Mylone 85W) to pesticide distributors for sale to dealers.

Mylone now is being used commercially as a preplanting treatment for control of weed seeds and soil pests in ornamental propagating beds and tobacco seed beds. Widespread experimental applications are continuing on vegetable seed beds, forest tree seed beds, and turf.

New Mylone 50D will be available from formulators next spring, Dr. Wellman stated. He said a label for the 50D formulation has been accepted by the U.S.D.A. for Mylone fumigant's current commercial uses.

STABLE AND HORSE FLY REPELLENCY DEMONSTRATED

Claims for repelling horse flies can now be made for livestock sprays and backrubber formulations containing Tabutrex insect repellent, according to Glenn Chemical Co. The company states that extensive field tests conducted over the past several seasons have produced impressive results against this extremely troublesome biting pest.

Although Tabutrex formulations without insecticide additives have proved effective in protecting cattle from biting flies, consumer reports have indicated that many dairy farmers preferred a spray which would destroy insects in the barn on contact and thereafter repel new waves of biting flies from cattle in the pasture. Practical pasture protection from horse flies and stable flies was achieved consistently with such formulations throughout the fly seasons.

The fact that these results were obtained with formulations which have been shown to leave no residues in milk or meat has been considered especially significant in view of the increased awareness of the problem of maintaining the purity of milk.

Beef cattle also received concentrated attention during the past summer. These animals cannot be sprayed so often nor so thoroughly as dairy animals since they are frequently left out on the range for long periods of time without attention. One of the effective fly control measures for these animals is the backrubber device which coats the back and sides of the animal when he rubs against a cable soaked with insecticidal oils. By adding Tabutrex to the insecticides normally used in backrubbers, the horse fly is repelled from the animal and is unable to inflict his painful bite.

New John Doe labels including latest permissible claims and recommended formulations are available from the Glenn Chemical Company, Inc., Chicago.

EMULSOL CHEMICAL CORP. DEVELOPS NEW EMULSIFIERS

The laboratory of Emulsol Chemical Corp. (division of Witco Chemical Co.), manufacturers of surface-active agents, has developed a new pair of low-cost emulsifiers, Emcols H-900 and H-902, for insecticide formulations.

Emcols H-900 and H-902 may be used separately or in combination for a number of insecticides, among them Aldrin, BHC, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Lindane, Parathion, Methyl Parathion and Toxaphene.

The company has also announced that it has made recent additions in plant equipment and improved procedures for quality control and uniformity in performance.

PYRETHRUM SAID TO ASSUME NEW VALUE AS INSECTICIDE

According to reports collected by African Pyrethrum Development, Inc., searching study toward development of insecticides that are safe for home and commercial usage but positive in their action against insects opened broad new fields of approved usage in 1957 for pyrethrum.

Research in the past year, conducted under the auspices of the Department of Agriculture and the Food and Drug Administration, were said to show conclusively that the African flower has taken on the "new look" in bug killing work. Modern development of synergists—chemicals that enhance and extend PYR's

natural elements without compromising its safety factor—now make PYR the likely "successor" to the chemical insecticides that were once thought to have supplanted it, A.P.D. said.

NEW PAIR OF BALANCED AGRICULTURAL EMULSIFIERS

Theodore Riedeburg Associates has announced Agrem 102 and Agrem 103, a completely new pair of balanced agricultural emulsifiers which the concern states can be blended together to produce outstanding emulsions of both insecticides and herbicides. This unusual versatility makes it possible to formulate such diverse products as toxaphene, DDT, heptachlor, 2,4-D and 2,4,5-T esters with one pair of emulsifiers —thus greatly simplifying inventory problems.

The list of pesticides and herbicides available today has grown so rapidly that it has become increasingly difficult to find a single emulsifier that will cover more than a portion of the spectrum. This is due to the fact that the polarities of commercial liquid formulations vary so widely. For example, toxaphene-kerosene solutions are very hydrophobic, whereas dieldrin-xylene is quite hydrophilic. Since the polarity of the emulsifier should be similar to that of the pesticide system, some way has to be found to adjust the emulsifier to "fit" each liquid. This, according to Riedeburg Associates, can be done quite simply by using two emulsifiers, one of which is hydrophobic (Agrem 102) and one hydrophilic (Agrem 103).

MARLATE LABEL CHANGES WITH METHOXYCHLOR STATUS

A revised label for Marlate 50 per cent methoxychlor wettable powder insecticide was registered with USDA in January, according to DuPont.

The new directions are in agreement with the January 17 action of the Food and Drug Administration setting a zero tolerance for methoxychlor in milk—which permits use of the insecticide only in ways which result in no residue.

Methoxychlor remains in good standing for direct application to dairy cattle as a dust, and for use as a spray in dairy buildings. Although it is no longer recommended for direct application to dairy animals by spray or dip, it is the only residual chlorinated hydrocarbon insecticide permitted to be used directly on dairy cattle.

DOW ANNOUNCES CHELATE CHANGES

A new chelating compound as well as new names for the entire chelate lines have been announced by Dow Chemical Co.

The new product is Versenol Z, designed for curing zinc deficiency in avocado orchards or deciduous trees of the northwest.

New names applied to chelate products will retain the Versenol and Versene trademarks but will be simplified. Versenol Iron Chelate will be known as Versenol F, Versenol Iron Chelate on Vermiculite will be Versenol FA, Versene Iron Chelate will be Versene F and Versene Iron Chelate on Vermiculite will be known as Versene FA.

by Dr. Melvin Nord

PATENT REVIEWS

RECOVERY OF AMMONIA FROM COKE OVEN GAS

U. S. 2,811,424, issued October 29, 1957 to Joseph van Ackeren, assigned to Koppers Co., Inc., describes improvements in spray-type ammonia saturators, in which the economy characteristic of such saturators is obtained without excessive capital investment and without sacrifice in those characteristics through which large crystals of ammonium sulfate are obtained.

As shown in Figs. 1 and 2 (the latter being a plan view partly in section taken along line II-II of Fig. 1), the apparatus consists of a crystallizer unit A, an absorber unit B, a mist precipitator unit C, and a vacuum evaporator D. All four units are constructed of cylindrical members arranged about a common vertical axis.

The absorber B is provided with a gas inlet 22 at one side and a gas outlet 24 at the opposite side (see Fig. 2). Coke oven gas enters through inlet 22 and divides into two streams, one passing around the left side of the crystallizer A and the other around the right side. The two streams unite at the opposite side and pass up out through outlet 24, which is located in the annular top plate 18.

The mist separator C has an outlet opening 28 and a tangential inlet 30 (see Fig. 2), leading from outlet 24 of absorber B by means of the riser E. A cylindrical baffle 44 at the top of the mist separator C separates the inlet 30 and outlet 28, helping to produce the vortex necessary to separate mist particles suspended in the gas.

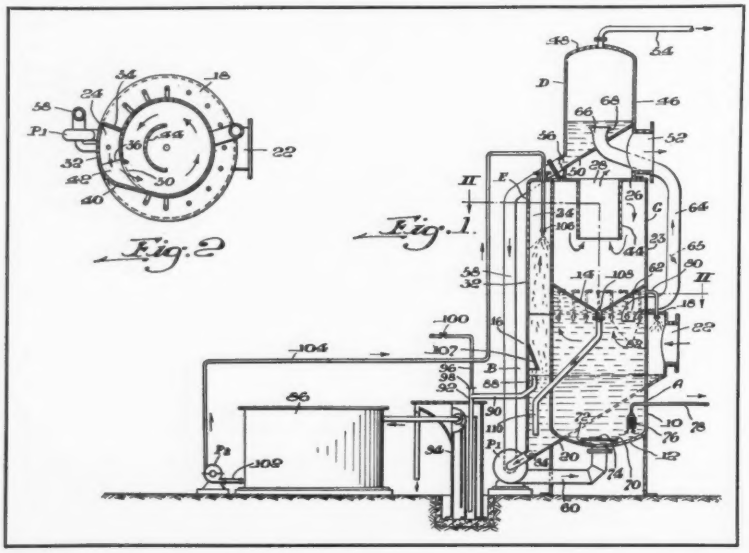
The vacuum evaporator D is provided with an outlet 54, leading to a barometric condenser. It is provided with a bottom outlet 56 leading to the suction of a pump P-1, and then to the bottom of crystallizer A. At the top of the crystallizer, an outlet pipe 62 communicates through pipe 64 with the vacuum evaporator D. Solution passes up through this pipe from an elevation somewhat below the top of the crystallizer A.

A circuit is thus established, in which solution is withdrawn from the crystallizer near the top through pipe 62, transferred through pipe 64 to the vacuum evaporator D, then through outlet 56, pipe 58, pump P-1, and pipe 60 back to the crystallizer. A throttle valve 65 in line 64 regulates the flow in this circuit.

The solution flows up through the crystallizer without eddies, after having passed through a perforated plate 70, effecting a classification of crystals. The larger crystals settle to the bottom and the smaller crystals rise toward the top. By the time the solution reaches the outlet pipe 62, it is essentially a desupersaturated solution. When it reaches the vacuum evaporator D, evaporation of water results in supersaturation of the solution, and this supersaturated solution is returned to the crystallizer. A suction head 76 near the bottom of the crystallizer permits withdrawal of a crystal slurry.

At the top of the crystallizer A are provided a number of outlets 80 with spray heads 82, discharging a spray of desupersaturated solution from the top of the crystallizer into the annular vessel constituting the absorber B. The spray collects in the bottom of the absorber and flows out through pipe 84 to the inlet side of pump P-1.

An overflow 88 leads to a tar skimmer 94. Make-up acid is added through pipe 96. Surplus liquor is stored in tank 86.



SOIL CONDITIONERS AND STABILIZERS

U. S. 2,807,910, issued October 1, 1957 to John G. Erickson, assigned to General Mills, Inc., provides polycationic soil conditioners, consisting of polyquaternary ammonium compounds. The quaternary ammonium groups react with the soil particles and tend to bind individual particles into aggregates of larger size, which no longer possess the colloidal properties of clay when wet.

By employing a polyquaternary ammonium compound which has an appreciable solubility in water, it is found that the principal effect on clay soils is an improvement in the porosity and friability of the soils. At the same time, the soil is put into a condition in which it may be readily wetted. The polyquaternary ammonium compounds are also useful for the stabilization of colloidal soils against erosion.

FERTILIZERS

U. S. 2, 809,093, issued October 8, 1957 to William B. Dancy, assigned to International Minerals & Chemical Corp., describes a process for the recovery of potash values from langbeinite ore in the form of potassium sulfate without the use of potassium chloride. In addition, a co-product is magnesium sulfate which can be used for the production of plant food.

U. S. 2,809,094, issued October 8, 1957 to Ulric B. Bray and Vanderveer Voorhees, describes a process for the production of ammonium sulfate and carbon from sulphuric acid sludges.

U. S. 2,810,627, issued October 22, 1957 to Henry F. Johnstone and William E. West, Jr., assigned to Texas Gulf Sulphur Co., describes a process for the recovery of sulfur dioxide from stack gases, and the production of ammonium sulphate from it.

U. S. 2,810,710, issued October 22, 1957 to Donald R. Long and assigned to The Borden Co., describes a process for making a ureaform fertilizer, containing condensation products of urea and formaldehyde.

An aqueous solution of urea and formaldehyde is prepared, containing 0.5-1.0 mole of formaldehyde per mole of urea, and having a *p*H of 7-9.5. Acid is added to establish a *p*H of 2.5-4.5, and the acidified solution is immediately subdivided into fine droplets suspended in a heated stream of air at a temperature above 100°C., so as to cause rapid condensation of urea and formaldehyde and drying of the droplets. An alkali is then mixed into the dried product to neutralize the acid.

The product is in the form of spherical particles of uniform composition. The fertilizer product presents a maximum of surface area and a minimum of variation in composition and extent of condensation between individual particles.

U. S. 2,811,254, issued October 29, 1957 to Phillip E. McGarry and assigned to International Minerals & Chemical Corp., describes a process for the beneficiation of Florida pebble phosphate ores by means of flotation.

PESTICIDES

U. S. 2,809,147, issued October 8, 1957 to Irwin Hornstein and William N. Sullivan (dedicated to the public), discloses an insecticidal film-forming composition, which is useful in application to porous surfaces and outdoor foliage. It consists of a chlorinated hydrocarbon insecticide and a film-forming chlorinated terphenyl.

U. S. 2,809,980, issued October 15, 1957 to Johannes T. Hackmann, assigned to Shell Development Co., discloses the use as fungicides of the salts of S-hydrocarbyl substituted isothioureas with Reinecke acid (tetrathiocyanodiammonochromic acid).

GYPSY MOTH

(Continued from page 44)

a new area of general infestation was found in adjacent Pennsylvania territory lying to the south of previously sprayed sections. No moths were recovered beyond the western limits of the quarantined area in New York where extensive acreage was surveyed in the central part of that State. Approximately 15 million acres were covered in the over-all 1957 trapping program.

Plans for the 1958 eradication spraying are being currently developed by program cooperators. Priority in spraying will be assigned to the treatment of outlying areas of infestation. Efforts will then be concentrated on elimination of the moth from extensive acreage at the outer limits of general infestation. ▲

Presented at the 5th Annual Meeting of the Entomological Society of America, Memphis, Tennessee, December 2, 1957.

Presented in cooperation with the Economic Insect Survey Section, Plant Pest Control Branch, Agricultural Research Service, USDA.

RESULTS OF FALL SURVEY ON EUROPEAN CORN BORER

AGRICULTURAL agencies in 24 states made observations and counts during the fall of 1957 to determine the number of European corn borers entering hibernation. The number of moths in the spring of 1958 depends upon the larvae entering hibernation and the number that survive the winter months. For the entire United States, comparing districts surveyed both in 1957 and 1956, the average for 1957 was 170 borers per 100 stalks and for 1956, 112.

Populations of the European corn borer entering hibernation in the Eastern United States dropped considerably under the 1956 fall number. The average for the Eastern States fell from 186 borers per one hundred corn stalks in 1956 to 104 in 1957. The exceptions to this noticeable drop were Rhode Island which showed a state average in 1957 of 312 borers per 100 stalks compared with 335 in 1956; Suffolk county, New York, which was considerably under the 1,089 count of 1956 but still had a high count of 550 for the fall of 1957; and Monmouth county, New Jersey, which had a count of 408 in 1957 compared with 597 in 1956.

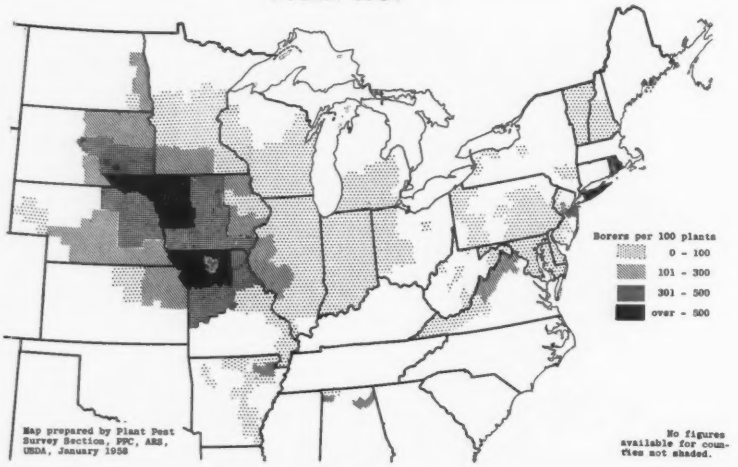
The North Central States showing higher larvae hibernation counts in 1957 than in 1956 are Iowa, Kansas, Missouri, Nebraska and southeastern South Dakota. Comparison for these States is as follows: Iowa 220 in 1956 to 419 in 1957; Kansas 31 to 119; Missouri 90 to 346; Nebraska 147 to 230; and South Dakota 52 to 363 borers per 100 corn stalks. The heaviest concentration of borers is in northern Missouri, western Iowa, northeastern Nebraska and southeastern South Dakota.

The over-all average for the North Central States rose from 102 borers per 100 stalks in 1956 to 178 in 1957.

Populations of the European corn borer reached a level in Arkansas and Alabama which justified a hibernation study during the fall of 1957. Thirty counties surveyed in Arkansas had an average of 28 borers per 100 stalks. In Alabama 4 counties were surveyed and an average of 141 borers per 100 stalks was found.

The spread of the European corn borer continued to be to the south in 1957, particularly in Arkansas, Alabama, Mississippi, and Louisiana. The notable spread during the year was the report of established infestations in 7 northeast parishes of Louisiana.

EUROPEAN CORN BORER ABUNDANCE
FALL 1957



GRASSHOPPERS INFEST ACRES OF RANGELAND

Grasshoppers, perennial insect problem of western and midwestern ranchmen and farmers, have been found on some 18,700,000 acres of rangeland in 16 states, as a result of late summer and fall Federal-State surveys, the U. S. Department of Agriculture reports.

It is within these areas that outbreaks requiring organized control effort are likely to occur next year, the Department says. The most widespread infestations were found in Texas, Montana, California, and Colorado.

Croplands infestation in general is lighter than it was a year ago. Largest threatening areas appear in Minnesota, Wisconsin, Kansas, Nebraska, North Dakota, South Dakota, and Montana. Control on such lands is handled by the farmers with technical assistance from USDA and state pest-control agencies.

The surveys reveal how many grasshoppers infest an area, and indicate potential severity of infestations for 1958. Surveys next spring for newly hatched grasshoppers will provide a final index of grasshopper populations and identify areas where control during the 1958 growing season will be essential to prevent severe losses.

PUBLIC LAW 518 (*Continued from page 43*)

were approved for use on certain crops prior to the enactment of P. L. 518 but for which no tolerances or exemptions have as yet been established. For example, residue data are lacking for 2,4-D where it is used on grass pasture and rangeland intended to be grazed by milk and meat producing animals. The status of MCPA is similar to that of 2,4-D. The only acceptable food use for 2,4,5-T is on rice. Residue data are needed for other uses of this chemical on food crops and for the related propionic and butyric phenoxy compounds. This list is, of course, not complete.

The question has been raised as to whether residue data on one herbicidal ester would be sufficient to cover other esters of the same acid. The interpretation by the law enforcement officials has been that each chemical must be evaluated on the basis of its pharmacology and residue data. If two or more esters exhibit similar pharmacological behavior it is likely that less residue data would be required for other esters of the same acid provided that the residue data were of the same magnitude in both cases.

In some instances, registration has been granted on the basis of meager data that indicate no residue would be present on the harvested crop. Additional data may be needed to assure continued label approval. These problems apply particularly to the use of pesticides on minor crops or to limited uses where industry has been reluctant to finance the cost of collecting the required residue data because of the limited sales potential. Research workers realize there may be a Government interest in such cases, particularly where the uses are included in Federal or State schedules. Possibly such problems can be solved by Government-industry cooperation.

As a step in this direction in April, 1956, the Field Crops Research Branch issued "Suggested Guide for Chemical Control of Weeds," ARS 22-23. This guide summarized the recommendations of the four regional conferences on weed control. The information in this handbook was compiled in consultation with the Pesticide Regulation Section and the Federal Extension Service. The recommendations are not being revised.

Although outstanding progress has been made in research with herbicides during the last few years much remains to be learned for their most effective use. When used on food plants a knowledge of the factors influencing their absorption, translocation, and distribution and breakdown is important. Research findings indicate that most of the modern organic weed killers break down reasonably quickly.

To comply fully with P. L. 518, information must be obtained on the metabolites of herbicides as well as on their toxicity and residues. ▲

FERTILIZER MATERIALS MARKET

New York

January 20, 1958

Sulfate of Ammonia. With the supply and demand in better balance, a steady market was looked for thru the Spring shipping season. There were still several large inquiries in the market for export which should take up any slack in the domestic market.

Ammonium Nitrate. Material was said to be moving fairly well in certain areas. However, weather conditions in other areas were holding back shipments.

Urea. Very little imported material has arrived recently and domestic producers are more or less dominating the market. Demand is fair at this time.

Nitrogenous Tankage. The present market range was from $3.25 to $4.00 per unit of ammonia ($3.95 to $4.86 per unit N) according to production points. While some producers were said to be sold out, there was still plenty of material available for sale as some buyers were trying to postpone shipments on existing contracts.

Castor Pomace. This material declined in price to $40. per ton, f.o.b. production points, because of an increased production. Last sales were made on this basis. No further sales of imported material were noted.

Organics. Trading was slow in organic fertilizer materials as most buyers prefer to wait until they actually need supplies rather than to buy ahead. Blood sold at $5.25 per unit of ammonia ($6.38 per unit N) f.o.b. Eastern points and tankage sold at $4.75 per unit of ammonia ($5.77 per unit N). Soybean meal was steady at about $43.50 per ton, f.o.b. Decatur, Ill., in bulk for prompt shipment and about $1.00 per ton higher for February shipment. Cottonseed meal was firm at $56.00 per ton in bags, f.o.b. Memphis, Tenn., and linseed meal was firm because of the short flax crop this year.

Fish Meal. Fish meal was slightly stronger in price due to replacement buying by the feed trade and last sales were made on the basis of $130. per ton, f.o.b. fish factories. The fertilizer trade was showing little interest at present market prices.

Bone Meal. The market was slightly firmer because of more interest from the feed trade with last sales made on the basis of $62.50 per ton, f.o.b. production points and with some imported bone meal for feed being sold at slightly higher prices.

Hoof Meal. A slightly better demand was noted for this material from industrial buyers and with fertilizer buyers only buying from hand to mouth. Last sales made on the basis of $5.25 per unit of ammonia ($6.38 per unit N), f.o.b. Chicago.

Superphosphate. This material continued in good supply with buyers taking delivery against contracts when needed. A better supply of triple superphosphate was noted.

Potash. Shipments continued against present contracts with foreign potash arriving at various ports. It is said present ocean freight rates are now favorable for the importation of potash from abroad.

Philadelphia

January 20, 1958

While some movement of raw materials has already started, it will still be several weeks before there is real shipping activity. Tankage and blood, and also fish scrap, are presently quoted higher than last month. While the situation is more or less normal for this time of the year, the prospects can be said to be encouraging.

Sulfate of Ammonia. Former large inventories have now been cleaned out and production has been materially cut. The market is accordingly in somewhat strong condition, with fairly good demand. Coke oven grade continues to be priced at $32.00 per ton.

Ammonium Nitrate. Market is reported in satisfactory shape with reasonably good demand. While the price went up to $72.00 per ton on January 1st, there have been quotations at $70.00 in some areas.

Nitrate of Soda. While domestic production and supply are said to be reduced, stocks of Chilean grade are said to be fully adequate to meet any present demand. Prices remain unchanged.

Urea. The 45 per cent nitrogen, agricultural, grade continues to be quoted at $110.00 per ton.

Blood-Tankage-Bone. The demand for blood and tankage has improved and prices are somewhat higher. Blood is presently listed at $5.25 per unit ammonia ($6.38 per unit N) New York area and $6.00 ($7.29 per unit N) Chicago. Tankage is $4.75 ($5.77 per unit N) New York and $6.25 ($7.59 per unit N) Chicago area. Bone meal remains at $62.50 per ton.

Castor Pomace. Production has been increased and price reduced to $40.00 per ton at present.

Fish Scrap. This has gained strength recently and is now quoted at $126.00 per ton for scrap, and $128.00 to $130.00 for meal.

Superphosphate. This continues to be quoted at 90 to 93 cents per unit APA per ton, with triple grade at 98 cents per unit. Situation rather quiet.

Potash. Conditions somewhat improved, although stocks are still large and strong competition is expected from impored material, and from new productions, including Canada. Muriate is still quoted at 34½ to 37 cents per unit K_2O per ton.

CARELESSNESS *(Continued from page 35)*

nitrogen solutions to be hazardous. It is possible for these conditions to exist at the required time and to the required degree in some fertilizer manufacturing. Enough of these conditions are known and enough of them can be controlled so that, in many plants, the risks can be and are being consciously held to a level that management deems the over-all operation to be satisfactory and practical. These operators are usually aware that carelessness can be costly.

Summary

The technical properties of some of the ingredients used in large quantities in modern fertilizer making are such that indiscriminate use of poor equipment can result in fires or explosions in extreme cases. Some of the conditions have been exposed; there may be others as yet not isolated, but a high degree of control has been effected when the conditions revealed are respected in operations.

Although they are no guarantee of immunity, the practices and equipment that use the ingredients most effectively are good precautions against hazards.

The requirements are generally that all ingredients, liquid and dry, be uniformly mixed throughout the entire mass, the acid and ammoniating medium particularly being so delivered that they are mixing uniformly as they enter the mass. These are also good operating techniques. ▲

Taken from a talk by Elmer C. Perrine entitled "Using Acids and Nitrogen Solutions Without Hazard—Carelessness Can Be Costly," delivered at the Fertilizer Section of the National Safety Congress in Chicago Oct. 21–22, 1957.

Production — October, 1957

Compiled from Government Sources

Chemical	Unit	October 1957	October 1956	Sept. 1957
Ammonia, synth. (anhydrous)	s. tons	322,557	272,708	290,624
Ammonia byproduct liquor (NH_3 content)	s. tons	1,392	1,602	1,339
Ammonium nitrate, fert. grade (100% NH_4NO_3)	s. tons	231,209	171,120	207,652
Amonium sulfate				
synthetic (technical)	s. tons	83,414	94,745	83,541
by-product (incl. amm. thiocyanate)	s. tons	75,167	78,850	74,497
BHC (Hexachlorocyclohexane)	pounds	———	6,112,666	———
Gamma content	pounds	———	1,011,709	———
Calcium arsenate (commercial)	s. tons	———	[1]	———
Copper sulfate (gross)	s. tons	4,160	4,952	5,828
DDT	pounds	———	———	———
2,4-D Acid	pounds	———	———	———
esters and salts	pounds	———	1,767,307	———
esters and salts (acid equiv.)	pounds	———	1,371,666	———
Lead Arsenate (acid and basic)	s. tons	459	[1]	431
Phosphoric Acid (50% H_3PO_4)	s. tons	384,834	320,709	*373,648
Sulfur, native (Frasch)	l. tons	462,145	529,056	444,779
Recovered[2]	l. tons	47,299	40,750	43,912
Sulfuric acid, gross (100% H_2SO_4)	s. tons	1,433,050	1,417,335	1,347,705
Superphosphate (100% APA)	s. tons	216,251	207,487	*188,705
Normal and enriched (100% APA)	s. tons	123,811	[3]123,231	*99,476
Concentrated (100% APA)	s. tons	74,062	65,215	*70,185
Other phos. fertilizers (incl. wet-base goods)	s. tons	18,378	[4]16,967	19,044
2,4,5-T Acid	pounds	———	———	———
Urea	pounds	———	———	———

*Revised. [1]Withheld to avoid disclosing figures for individual establishments. [2]Recovered sulfur of a purity of 97 per cent or greater. [3]Excludes enriched superphosphate, quantities of which if added to normal superphosphate fertilizers would account for less than 2 per cent of the total. [4]Excludes wet-base goods, quantities of which if added to other phosphatic fertilizers would account for less than 6 per cent of the total items except stocks. Stocks of wet-base goods would account for less than 5 per cent

Alphabetical List of Advertisers

Buyers' Guide

Classified Index to Advertisers in 'Farm Chemicals'

ALDRIN
Ashcraft-Wilkinson Co., Atlanta, Ga.

AMMONIA—Anhydrous and Liquor
Allied Chemical & Dye Corp., Nitrogen Div., N.Y.C.
American Cyanamid Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
Commercial Solvents Corporation, New York City
E. I. duPont de Nemours & Co., Wilmington, Del.
Escambia Chem. Corp., Pensacola, Fla.
Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Mississippi River Chem. Co., St. Louis, Mo.
Phillips Chemical Co., Bartlesville, Okla.
Sinclair Chemicals, Chicago, Ill.
Sohio Chemical Co., Lima, O.
The Texas Co., New York City

AMMONIUM NITRATE
American Cyanamid Co., New York City
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Monsanto Chem. Co., St. Louis, Mo.
Mississippi River Chem. Co., St. Louis, Mo.
Phillips Chemical Co., Bartlesville, Okla.

AMMONIUM SULFATE
See Sulfate of Ammonia

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The Burlap Council, New York City
Chase Bag Co., Chicago, Ill.

BAGS—COTTON
Chase Bag Co., Chicago, Ill.

BAGS—Multiwall-Paper
Chase Bag Co., Chicago, Ill.
Hudson Pulp & Paper Corp., N.Y.C.
Kraft Bag Corporation, New York City
Union Bag—Camp Paper Corp., New York City

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BAG CLOSING MACHINES
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Pennsylvania Salt Mfg. Co., of Wash., Tacoma, Wash.

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BIN DISCHARGERS
Stephens-Adamson Mfg. Co., Aurora, Ill.

BONE PRODUCTS
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
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Woodward & Dickerson, Inc. Philadelphia, Pa.

BORAX AND BORIC ACID
American Potash & Chemical Corp., Los Angeles, California
Woodward & Dickerson, Inc., Philadelphia, Pa.

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Woodward & Dickerson, Inc., Philadelphia, Pa.

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Baughman Mfg. Co., Jerseyville, Ill.

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Geigy Agr. Chems. Div. Geigy Chem. Corp. N.Y.C.

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Velsicol Chemical Corp., Chicago, Ill.

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Ashcraft-Wilkinson Co., Atlanta, Ga.
Thomas Alabama Kaolin Co., Baltimore, Md.

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H. J. Baker & Bro., New York City
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Ashcraft-Wilkinson Co., Atlanta, Ga.
Geigy Agr. Chems., Geigy Chem. Corp., N.Y.C.
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DIAZINON
Geigy Agr. Chems. Geigy Chem. Corp., N.Y.C.

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Ashcraft-Wilkinson Co., Atlanta, Ga.

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Vulcan Containers, Inc., Bellwood, Ill.
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Velsicol Chemical Corp., Chicago, Ill.

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Buyers' Guide

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Southwest Potash Corp., New York City
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Johnson-March, Philadelphia, Pa.

SOLVENTS
Richfield Oil Corp., Los Angeles, Calif.

SHOVEL LOADERS
Clark Equipt. Co., Benton Harbor, Mich.
Hough, The Frank G. Co., Libertyville, Ill.
Tractomotive Corp., Deerfield, Ill.

SLUDGE
H J. Baker & Bro., New York City

SPRAYS
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.
Baughman Mfg. Co., Jerseyville, Ill.

SPREADERS, TRUCK
Baughman Manufacturing Co., Jerseyville, Ill.

STORAGE TANKS
Cole, R. D., Manufacturing Co., Newnan, Ga.

SULFATE OF AMMONIA
Allied Chemical & Dye Corp., Nitrogen Div., N.Y.C.
American Agricultural Chemcal Co., N. Y. C.
American Cyanamid Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Phillips Chemical Co., Bartlesville, Okla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFATE OF POTASH—MAGNESIA
International Min. & Chem. Corp., Chicago, Ill

SULFUR
Ashcraft-Wilkinson Co., Atlanta, Ga.
Texas Gulf Sulphur Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFUR—Dusting & Spraying
Ashcraft-Wilkinson Co., Atlanta, Ga.
U. S. Phosphoric Products Div., Tennessee Corp. Tampa, Fla.

SULFURIC ACID
Allied Chemical & Dye Corp. General Chemical Div., N. Y. C.
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SUPERPHOSPHATE
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
Davison Chemical Co., div. of W. R. Grace & Co. Baltimore, Md.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SUPERPHOSPHATE—Concentrated
American Cyanamid Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
Davison Chemical Co., Div. of W. R. Grace & Co., Baltimore, Md.
International Min. & Chem. Corp., Chicago, Ill.
Phillips Chemical Co., Bartlesville, Okla.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TALC
Ashcraft-Wilkinson Co., Atlanta, Ga.

TANKAGE
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

TANKS—NH3 and Liquid N
Cole, R. D., Manufacturing Co., Newnan, Ga.

TOXAPHENE
Ashcraft-Wilkinson Co., Atlanta, Ga.

TRUCKS—SPREADER
Baughman Mfg. Co., Jerseyville, Ill.

UREA & UREA PRODUCTS
Allied Chemical & Dye Corp., Nitrogen Div., N.Y.C
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
E. I. duPont de Nemours & Co., Wilmington, Del.
Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Sohio Chemical Co., Lima, O.

UREA-FORM
E. I. duPont de Nemours & Co., Wilmington, Del.
Nitro-Form Agricultural Chemicals, Woonsocket, R. I.

VALVES
Monarch Mfg. Works, Inc., Philadelphia, Pa.

ZINC SULFATE
Tennessee Corp., Atlanta, Ga.

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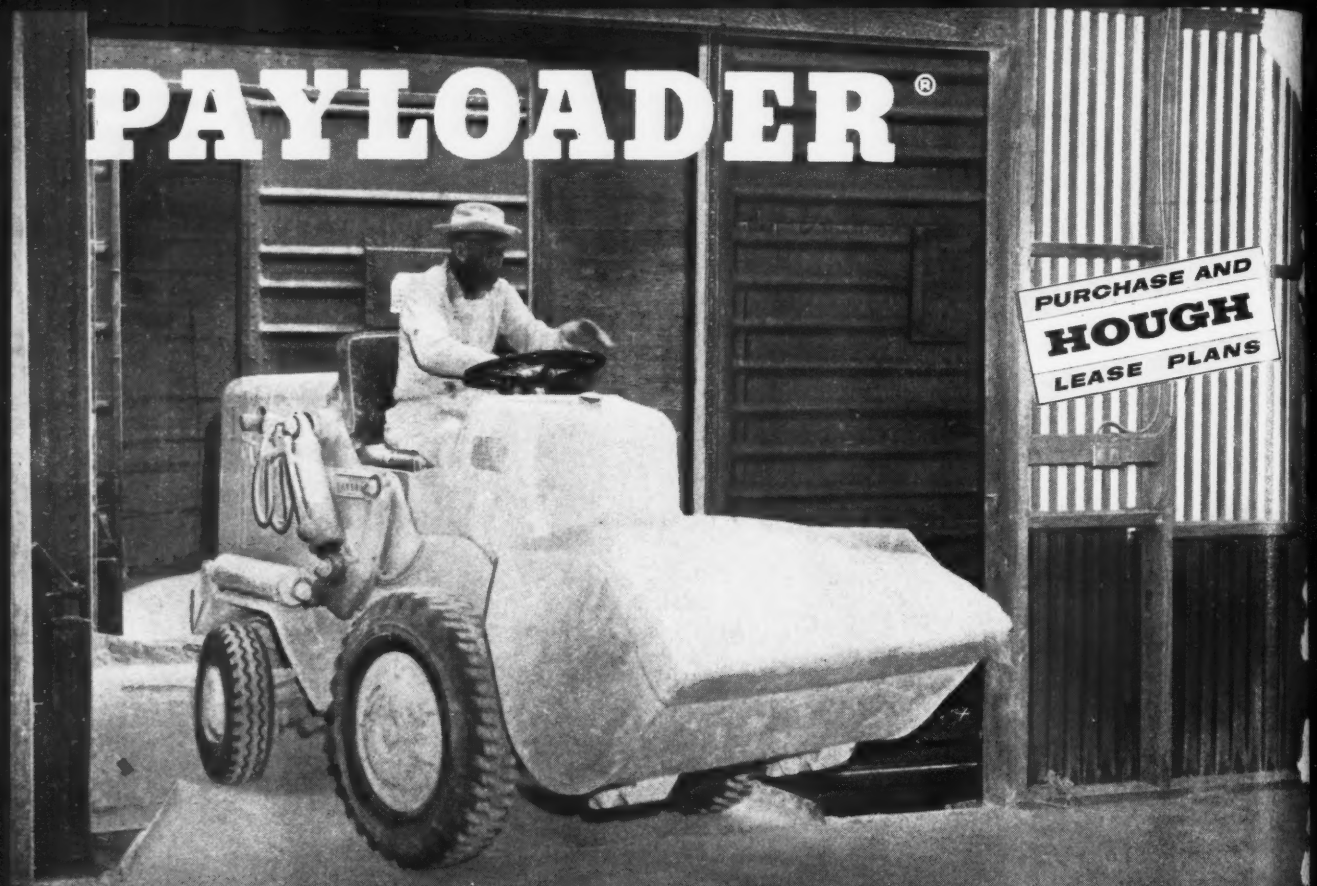

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